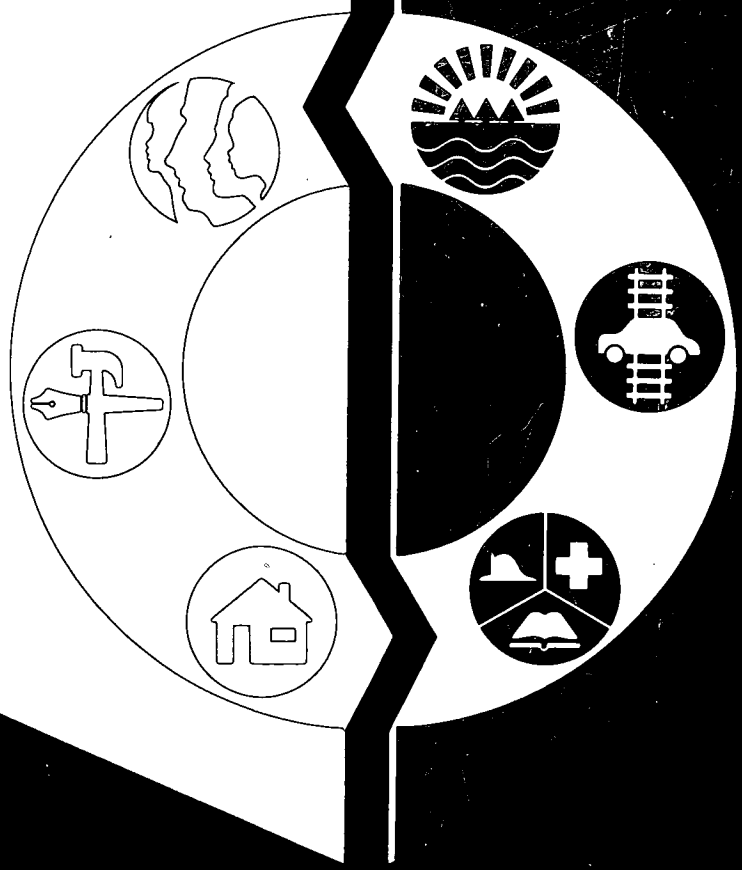
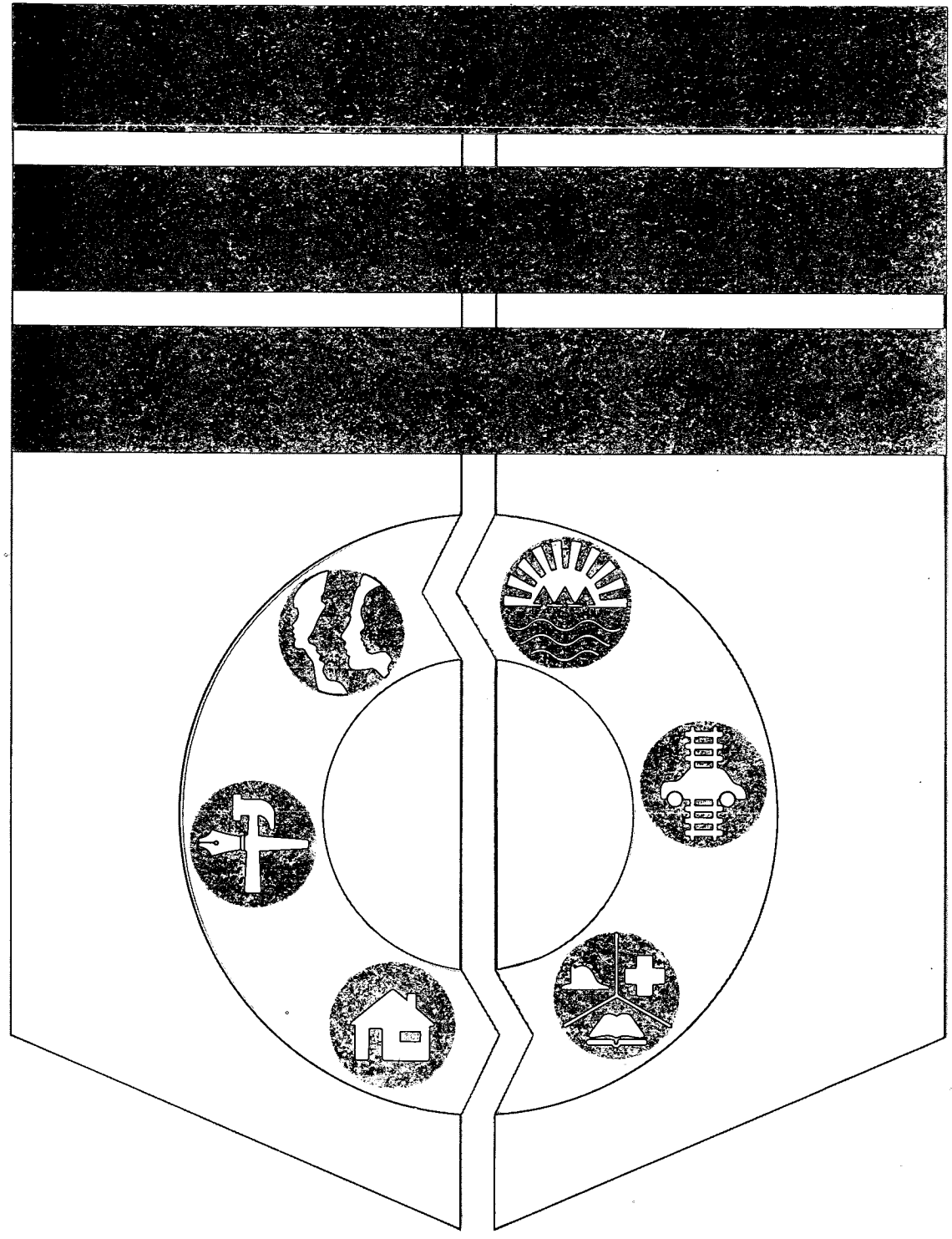
fifth

GROWTH POLICY

report
of
the
MONTGOMERY
COUNTY
PLANNING
BOARD
june
1979



PLANNING, STAGING & REGULATING



Fifth GROWTH POLICY REPORT

JUNE 1979

John Jansen

Planning STAGING & Regulating

THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

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The Maryland-National Capital Park and Planning Commission is a bi-county agency created by the General Assembly of Maryland in 1927. The Commission's geographic authority extends to the great majority of Montgomery and Prince George's Counties: The Metropolitan District (for parks) comprises 919 square miles in the two counties, while the Regional District (for planning) includes 1,001 square miles.

The Commission has three major functions: (1) the preparation, adoption, and from time to time, amendment or extension of the General Plan for the physical development of the Maryland-Washington Regional District; (2) the acquisition, development, operation, and maintenance of a public park system in the Maryland-Washington Metropolitan District; and (3) in Prince George's County, the operation of the entire County public recreation program.

The Commission operates in each County through a Planning Board, appointed by and responsible to the County Council. All local plans, recommendations on zoning amendments, administration of subdivision regulations, and general administration of parks are responsibilities of the Planning Boards.

TITLE: PLANNING, STAGING, AND REGULATING, Fifth Growth Policy Report of the Montgomery County Planning Board

AUTHOR: The Montgomery County Planning Board of The Maryland-National Capital Park and Planning Commission and Richard E. Tustian, Planning Director

SUBJECT: Proposed Comprehensive Staging Plan, expressed in terms of interim growth thresholds, for subareas of the county, which are keyed to future public facility projects; to be reviewed bi-annually as a complementary action to a similar bi-annual review of the Capital Improvements Program.

DATE: June 1979

PLANNING AGENCY: The Montgomery County Planning Board of The Maryland-National Capital Park and Planning Commission

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ABSTRACT: This document outlines a revised comprehensive framework for managing urban growth through the orchestration of a variety of tools; of which the major new addition is a Comprehensive Staging Plan (CSP). A process is proposed whereby the CSP is coupled with the Capital Improvements Program (CIP), in an alternating cycle of bi-annual policy reviews, thus giving continuing guidance to both public and private sector inplementation actions. A specific, first round, staging plan is proposed, based on transportation and sewerage constraints; and models for analyzing other systems elements, such as fiscal, are described.

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INTRODUCTION

This is the fifth in a series of growth policy reports. These reports are intended to help focus an evolving perspective of the growth management process in the County, and to assist in the guidance and coordination of the many ongoing activities that together constitute that process over the year. While previous reports contained action recommendations relevant to the situation at the time, they also explored a developing sequence of tools and ideas.

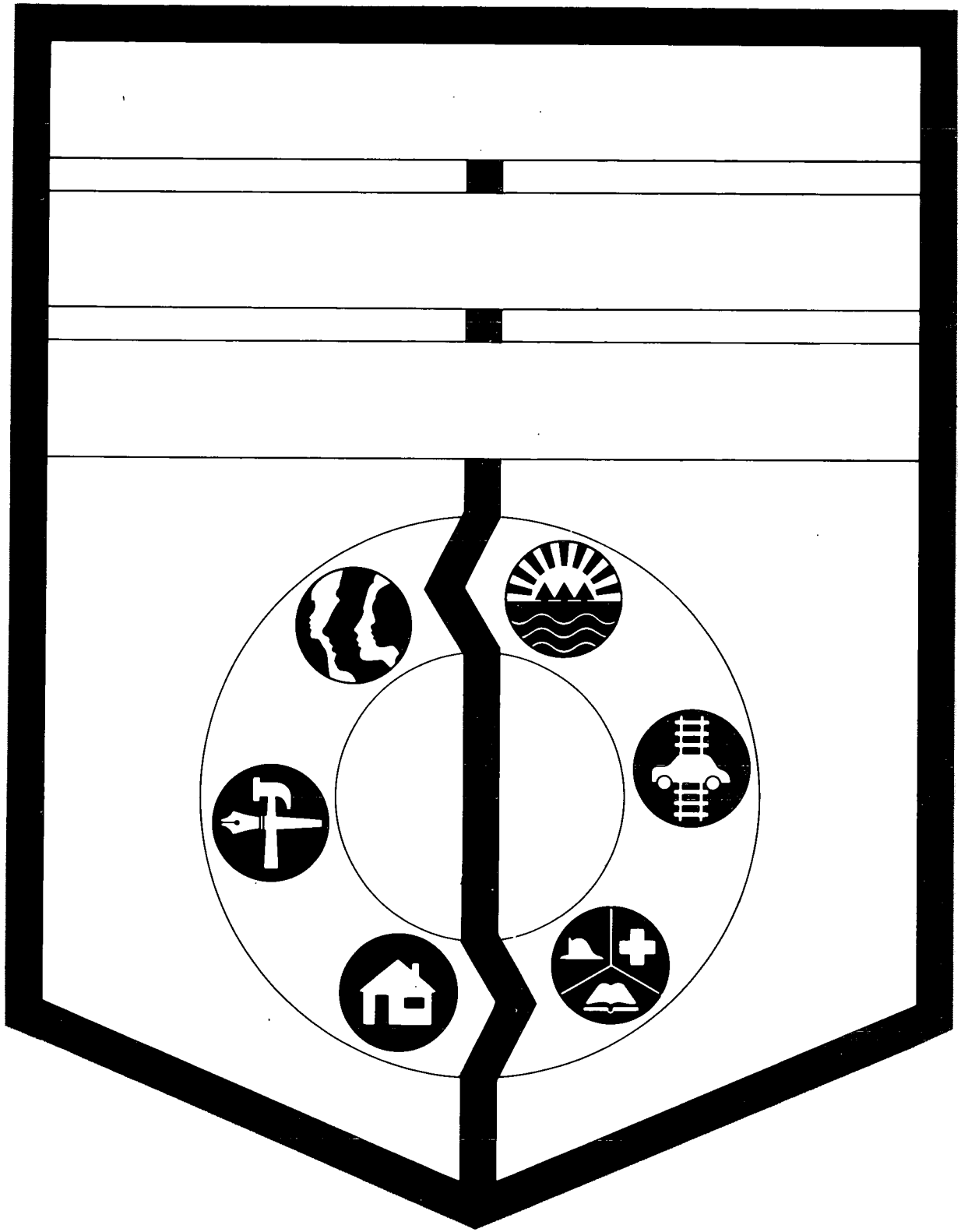
The first report, called Framework for Action, in addition to describing issues of the day and a general policy approach to them, laid out a preliminary concept model of the comprehensive growth management process. One of the key ideas in this model was the necessity to distinguish between the public and the private sectors, and to recognize the fiscal and constitutional limitations on local government capabilities.

The second report, called Fiscal Impact Analysis, and its Sequel--Environment and Transportation, produced recommendations derived from testing the fiscal implications of alternative future rates of growth. It also developed a computerized fiscal analysis model, and outlined the importance of the "level of service" idea to the concept of fiscal management.

The third report, called Forecast--People, Jobs and Housing, was a technical report that documented the Planning Board's then-current population forecasts. It also outlined a computerized set of linked demographic, economic, and land use models. One of the key ideas that subsequently developed out of this experience was the "investment risk analysis" concept. This involved the need to accept a range of uncertainty in forecasting, and the corollary need to adjust the public investment planning process, so that it will test the implications of both the top and bottom of the forecast range.

The fourth report, called Carrying Capacity and Adequate Public Facilities, recommended improvements to the County's Adequate Public Facilities Ordinance, and proposed the preparation of a countywide staging policy, based on the tools and ideas developed to date. One of the key ideas outlined was the "carrying capacity concept," which involved the selection and analysis of critical elements within the public service systems, through implementation of another idea, called the "adequate public facilities" concept.

This fifth report, called Planning, Staging and Regulating, carries out the recommendations of the fourth report, and produces a draft countywide staging policy for public review and comment. One of the key ideas developed is the concept of "staging," as providing the necessary and desirable link between the concepts of "planning" and "regulating," on the private sector side of growth management, and between "planning" and "budgeting," on the public sector side. Ways are outlined by which the implementation of this linkage can fit within the existing charter, statutes, and structure of the Montgomery County Government.



Chapter One

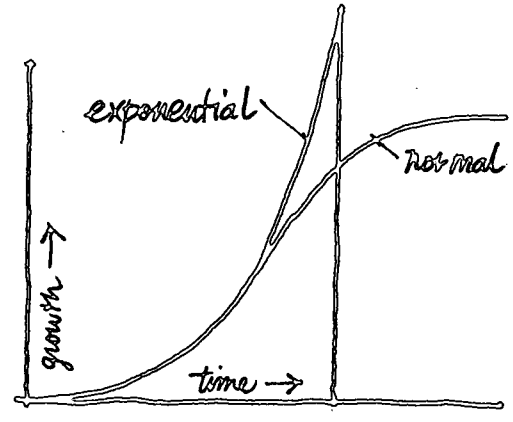
Framework

FRAMEWORK 1

Growth Management Versus Growth Accommodation

Prior to about 1970, urban planning in the United States was largely based on the implicit concept of growth "accommodation." Since then, planning has increasingly moved toward the explicit concept of growth "management," as the result of a significant shift in public perception and demand.

Whatever the various roots of this shift in demand, in such other areas as the environmental and consumer protection movements, there is in common an underlying concern that uncontrolled urban growth patterns may lead to disastrous results. The analogy is borrowed, from the biological sciences, of the abnormal or exponential growth rate curve. This curve, when it occurs in other life forms, always reaches some critical stress point, beyond which there ensues a sudden, sharp, or cataclysmic decline, with consequential ill effects. By contrast, normal organic growth appears as an "S" shaped curve, which levels off at whatever happens to be the organic growth ceiling of the particular organism.



How precisely such analogies apply to the human experience is debatable. But the growth "management" concept does implicitly build on the premise that urban growth is not an organically self-regulating process; and that, therefore, government must take steps to ensure that the detrimental side effects of the growth process are ameliorated in the public interest.

Within the old framework of growth "accommodation," planning was not expected to delve deeply into the originating and organizing forces of growth. Rather, planning was expected to lay out end-state patterns of land uses and public facilities, so that everything would be as harmonious as possible when all was finished. This context logically led to an emphasis on physical and spatial, end-state, land use plans, with a further focus on the size, shape, and locational attributes of zoning and public facility decisions. Within the era of relatively high affluence since the Second World War, local government was expected, in general, to tidy up the rough edges of the emerging land using pattern-through "planning"; and to provide the necessary public facilities to serve this pattern-through "budgeting."

The growth management concept, by contrast, requires government not only to provide the "planning" and the "budgeting," but also to question the premises of the growth itself. The result is a need to analyze, not just the locational aspects of growth, but also its timing and cost dimensions. The incorporation of these dimensions into a systematized approach has come to be known in Montgomery County as "Staging," perceived of as constituting an important element of the more general term "growth management."

To integrate the necessary combinations and permutations among all these dimensions constitutes a very complex and ambitious intellectual endeavor. In recognition of the practical necessity to scale this endeavor down to manageable size, the Montgomery County growth management effort began by examining the nature of the powers of local government, and their inherent limitations.

Purse-Power & Police Power

All management powers can be classified into two simple categories: those of the "carrot," and those of "stick." While there is a wide range of potential activities under each of these headings, the major "carrot" for local governments is the provision of public facilities and services; and the major "stick" is the restriction of private land use development through regulations. Since public facilities are ultimately determined by financing and taxation, they may be thought of as a function of money. Since development regulations are ultimately enforceable at law through coercive actions, they may be thought of as a function of force. Thus, these two basic tools of growth management may be designated simply as: the "purse power," and the "police power."

These two powers have characteristics sufficiently different from each other to warrant a clear delineation between them. In exercising the "purse power," local government can function primarily as a corporate owner, and employer, of the facilities and services it operates. With the knowledge derived from ownership, and the power derived from control over its employees, it can plan and implement public facilities and services with a relatively strong sense of certainty.

In exercising the "police power," however, local government must function with considerably less scope and authority. With less visibility into the operations of the private activities under regulation, and with only

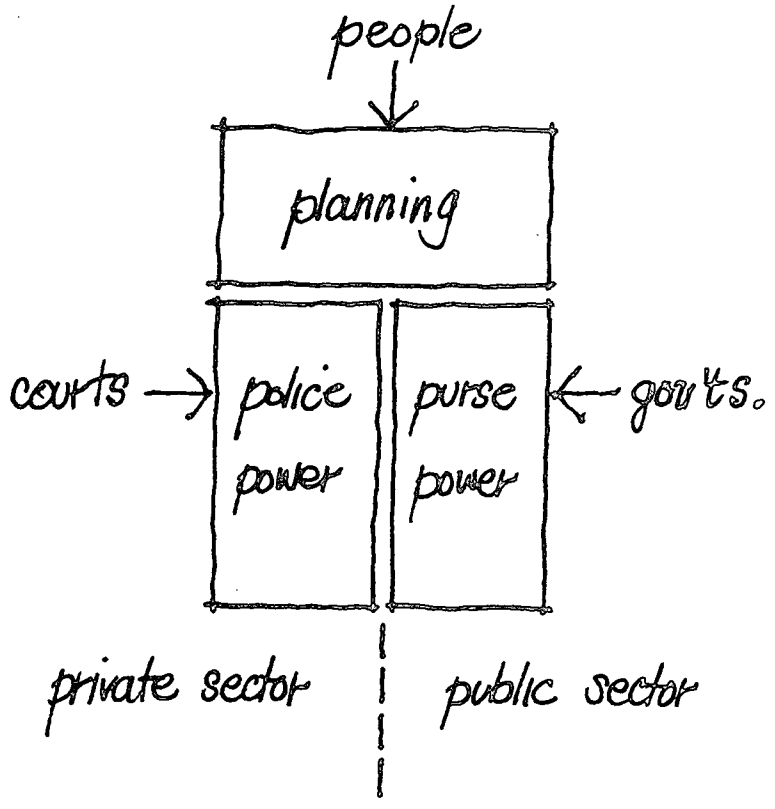
limited legal sanction to control them, it must plan and implement its land use regulations with a much lower degree of certainty. It is important to successful growth management to keep the relative differences between these two powers clearly in mind.

Public & Private Sector Constraints

It is also important to recognize the way in which external agents place specific restrictions on local governments with respect to these two powers. On the "purse power" side, a democracy imposes on its government the restraints that emerge from the will of the people, as exercised through the electoral and political process. In a democracy of federated states, "purse power" at the local level is further constrained by the policies and actions of the federal and state governments, through various kinds of pass-down, revenue-sharing procedures.

On the "police power" side, a constitutional democracy, such as the United States, also imposes significant restrictions on its government. In this case, the constraints are exercised through the courts, which are charged with protecting the civil and property rights of individual members of society. To extend the "police power" into new applications requires explicit justification, in terms of the demonstrable public interest at stake, in order to be sustained by the courts through the process of affected party litigation.

In summary, the "purse power" of local government often is significantly constrained by the actions of higher levels of government; and its "police power" often is significantly constrained by the actions of the courts--two external agents with quite different premises, approaches, and methods of procedure. For convenience we may distinguish between them by characterizing one as the "public sector" approach, and the other as the "private sector" approach.



Since the shift from growth "accommodation" to growth "management" frequently has generated controversy over private sector, "police power" techniques, it is desirable to promote better public understanding of the role of the courts. The courts stand as defenders of individual freedoms against unwarranted extensions of the "police power." To be successful, growth manage-

ment efforts must convince the courts that new "police power" applications are genuinely needed in the public interest. Consequently, growth management efforts that involve new regulatory techniques must demonstrate a "public-purpose rationale," which can stand, not only the test of public scrutiny, but also the test of litigation.

The Carrying Capacity Rationale

A general "public-purpose rationale" for growth management not only should be deductively logical in arguing from cause to effect, it also should be bottomed on some axiomatic principles that are likely to appear to a court as self-evident, and consistent with the general social sanction of the populace. While there is as yet no clear statutory definition, there does seem to be emerging a loose concensus that the concept called "carrying capacity" can provide the nucleus of such a set of axiomatic principles.

The term "carrying capacity" derives from the language of ecology and agriculture. There it refers to the maximum number of animals of a given species that can graze, or otherwise feed off the food chain resources, of a particular area of land, without destroying the food supply. The extension of the concept to apply to the amount of urban growth that can be safely accommodated within an urban area is a new intellectual endeavor.

Essentially, it involves a four-step idea: (1) that there can be separated out from the full complexity of the overall urban fabric a set of elements with sufficient internal cohesion to be treated as systems; (2) that techniques can be developed by which to measure the degree of "stress" placed on each of these systems as a consequence of growth; (3) that "acceptable stress thresholds" can be established for each system, beyond which that system will be significantly damaged, or forced to function in a manner that adversely affects the aggregate health of the total urban organism, unless the carrying capacity of that system can be improved somehow; and (4) that, as a consequence, governmental efforts to prevent such a stress overload from occurring in one or more systems can be justified and carried out. These four steps may be called: (1) Systems Analysis; (2) Stress Measurement; (3) Threshold Standards; and (4) Implementation.

The analogy to medical science and the systems of the human body is obvious. Compare, for example, the biological effects of stress, obesity, and diet on the body's nervous, circulatory, and digestive systems. Disorders in the nervous system may range from marginal sensory impairment, through anxiety and disorientation, to a nervous breakdown. Circulatory system disorders may range from the mildly fatiguing effects of poor blood circulation, through the moderately serious effects of high blood pressure and hardening of the arteries, to the crippling effects of a heart attack. Digestive system disorders may range from relatively infrequent occurrences of indigestion, through more painful problems to such debilitating conditions as ulcers. A significant impairment to any one of the systems is sufficient to materially affect the functioning of the body as a whole.

A rough medical analogy to the four steps of the carrying capacity idea might be: (1) understanding; (2) diagnosis; (3) prescription; and (4) application.

Step One-Systems Analysis:

The Urban Fabric Growth Model

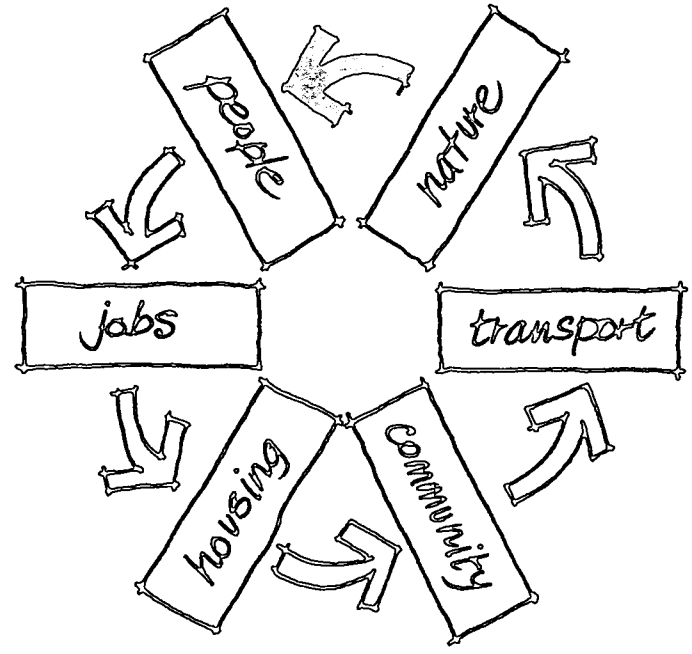
The first step in applying the carrying capacity rationale requires the careful separation, into separate strands of system elements, of the apparently seamless web of the urban fabric. We have chosen to divide the fabric into six basic elements, and have named them: People, Jobs, Housing, Community, Transportation, and Nature. These headings characterize six thought compartments, into at least one of which can be dropped every problem of urban life, whether large or small. They link logically together in several ways. The first is a loosely structured linear chain of relevance, that loops back upon itself to form a closed circle.

The primary element of this feed-back loop is "People." They come to a metropolitan area through either birth or migration.

People move for "Jobs," or from the lack of them. Thus, the economy of the region is the second most important element of the fabric; and in many respects it is the most significant driver of urban growth.

After Jobs, comes "Housing." Most of the major housing decisions made by People are conditioned in some way, or indeed determined, by the employment situation.

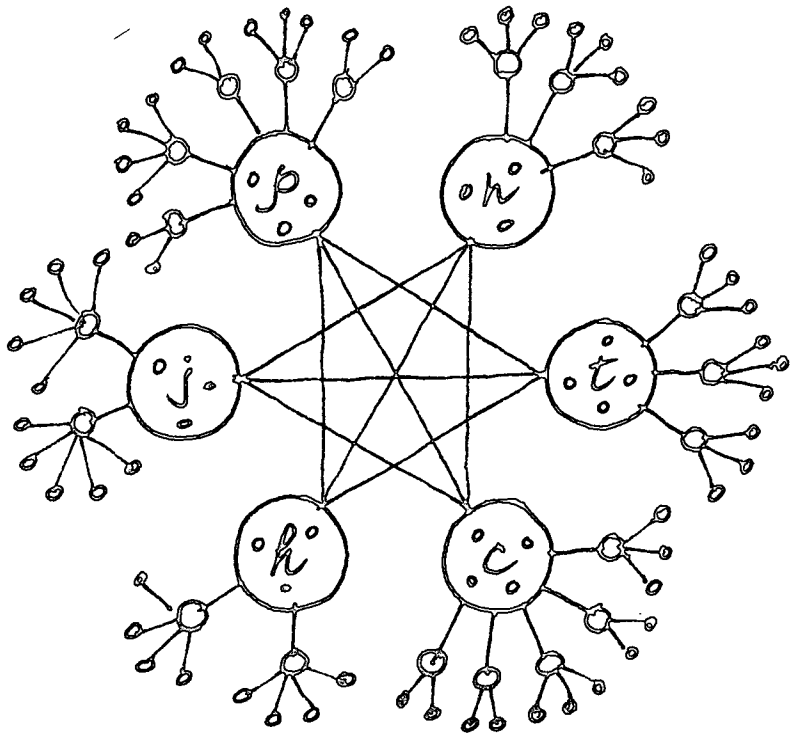
But, they are also influenced by the nature of the "Community" within which the Housing is located. Thus, the things that go to make up the idea we call Community, (i.e. schools, neighbors, clubs, etc.) constitute a fourth strand in the urban fabric.



At this point, we must recognize that the ability of People, to spread the daily time-web of their lives across the elements of Jobs, Housing, and Community, is dependent upon the available pattern of "Transportation."

And, finally, we must recognize that the previous five strands of the urban fabric are an overlay on the pre-existing natural conditions of the place. If they are woven so densely as to prohibit "breathing," the garment will not wear well in all seasons, and indeed may ultimately become a shroud. Thus, "Nature" is the sixth and ultimate element of urban growth, which closes the relevance circle, through its impact on the life support systems of the human family in the "People" element.

As will be seen subsequently below, this simple six element model can sustain considerable elaboration in a variety of different directions. Each of the elements can be linked to its neighbors, not just to either side on the loop, but also radially across the circle. Each of the elements also can be further subdivided into an ever branching tree of more narrowly defined subelements. And finally each of the elements can be used as a classification device, for comparing the different branches of human knowledge that are most relevant to them, so that differences in perspective that arise from differences in premises and methodologies among the professions, the soft sciences, the hard sciences, and the humanities can be better understood.



In short, the model provides a simple compass by which to steer an analytic path through the light and shadow cast by the complex weave of the urban fabric, and it fulfills the requirements of the first step of the carrying capacity rationale.

Step Two-Stress Measurement:

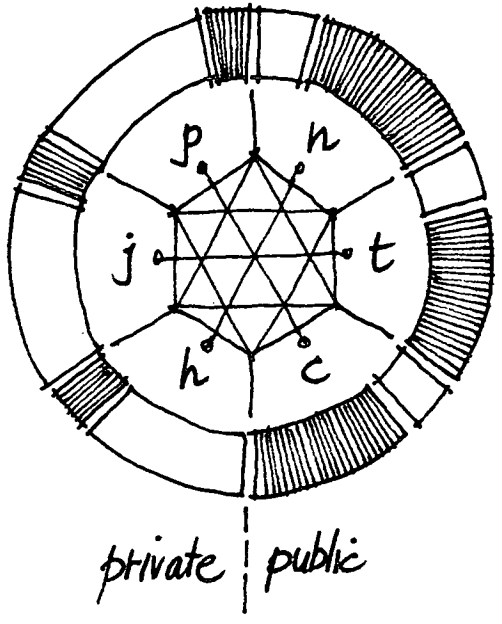
The Public/Private Level of Service Index

To achieve the second step of the carrying capacity rationale, namely to find a technique by which to measure the stress levels of these systems, we must refine the growth model further. We are searching for a way to define the internal system linkages within the model, so that we may subject them to a "threshold stress level" analysis.

We begin by noting that each of the six urban fabric elements can be divided into a public sector component and a private sector component. Thus, the People element, in its private sector component, consists of individuals and such interpersonal relationships as families, clients, purchasers, contractors, etc.; while in its public sector component it consists of legislatures, courts, and agencies of government. Similarly, Community, in its private sector component, consists of such things as private clubs, separate schools, churches, commercial theaters, etc.; while in its public sector component, it consists of such government-operated facilities as public schools, libraries, police, fire, and welfare services, etc.

We note that the relative proportion of public to private within the three elements, called Community, Transportation, and Nature, is much higher than among the other three. This is because government historically has been mandated a strong responsibility for the maintenance of

community public facilities, adequate roads and transit, and freedom from environmental pollution. By contrast, the maintenance of balance in Housing, Jobs, and the interpersonnal relationships of the People element has been perceived historically in this nation as much more a matter for private transactions.

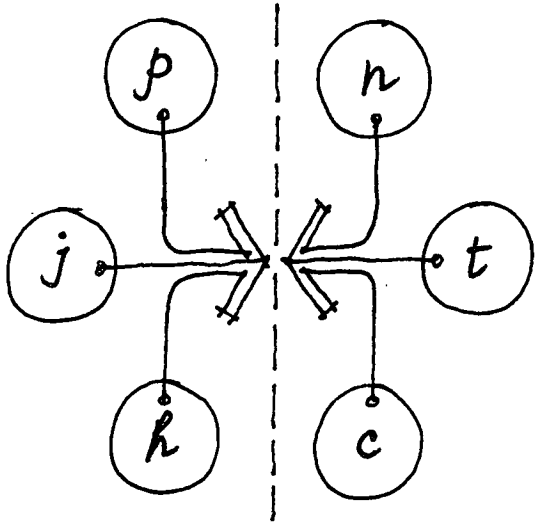


This division of the model elements into a public sector set, and a private sector set, fits nicely with the established practice of justifying public sector services in terms of private sector needs. From this we note that the actual relationship prevailing at any given time between these needs and services can be defined in terms of some sort of "level of service" index. In equation format, this is expressed as below. When needs increase relative to services, the "level of service" index goes down; and vice versa.

$$\frac{\text{Public Services}}{\text{Private Needs}} = \text{Level of Service (L)}$$

By assigning the appropriate model elements to their respective private and public sectors, the above generic equation can be expressed as:

$$\frac{\text{Community + Transportation + Nature}}{\text{People + Jobs + Housing}} = \text{Level of Service (L)}$$



By then separating out each of the public sector elements, to be treated separately as a single urban system impacted by the full range of private sector needs, we can divide this one general equation into three special equations. These will then yield a "level of service" index for each of the three public sector systems, as shown below.

$$\frac{\text{Community}}{\text{People + Jobs + Housing}} = \text{L (Community)}$$

$$\frac{\text{Transportation}}{\text{People + Jobs + Housing}} = \text{L (Transportation}$$

$$\frac{\text{Nature}}{\text{People + Jobs + Housing}} = \text{L (Nature)}$$

With the creation of these equations, we have developed a conceptual tool for carrying out the second step necessary in the "carrying capacity rationale." This "level of service" index idea can now be refined for use as a measure of the "threshold stress level" of each of the systems.

The Public Sector Subsystems

To progress towards the point of actual threshold measurement, we must next trace out the sub-systems within the three public sector components of the three major urban elements, Community, Transportation, and Nature. The Table below shows the general classification system that we have used.

Community

Safety
police, fire, health

Education
elementary schools, junior high schools, senior high schools, junior college

Culture
libraries, social/recreation centers, crafts/arts centers, community centers, museums

Welfare
assistance projects for the handicapped, disadvantaged, aged, poor and other special situations, and job supplements, and housing subsidies, (a transference, from the People, Jobs, and Housing private sector elements of part of their relatively small "public" component, to allow for inclusion of all public expenditure items on the public sector side of the equation)

Government
legislative, executive, judiciary, special (a transference, from the People private sector element, of this part of its relatively small "public" component, to allow for inclusion of all public expenditure items on the public sector side of the equation)

Transportation

Roads
freeways, expressways, arterials, primaries, secondaries, tertiaries, bikeways, footpaths

Transit
commuter rail, rapid rail, light rail, arterial bus, neighborhood bus, special bus

Mobility
governmental projects that analyze or influence transportation behavior through such aspects as parking, carpooling incentives, price structure, public education, etc.

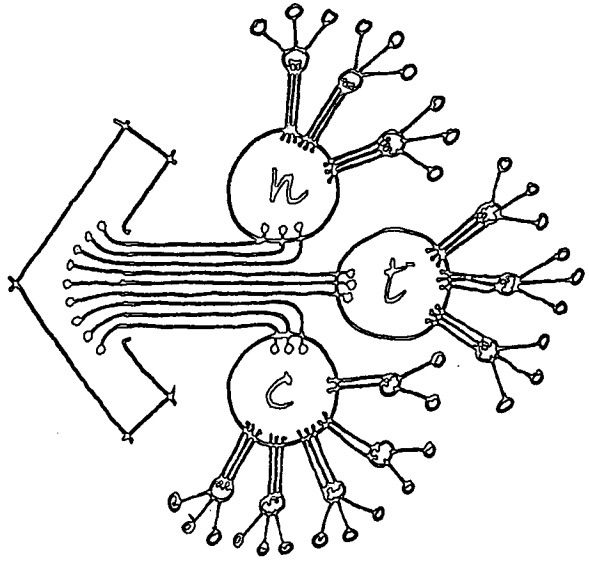
Nature

Earth
minerals, soils, agriculture, flora, fauna, parks

Air
noise, smog, solar energy, weather, climate

Water
supply, waste, runoff, flood, stream purity, aquatic life

As this classification process branches into evermore specific categories, there develops the picture of a "systems tree" with its roots in the common soil of the public sector, and with three main limbs from which flow branches, from which flow twigs and so on, until we stop the process at some point with a pattern of tiny leaves, each with a focussed definition in terms of some specific public sector operation.



It is clearly impractical to attempt to measure the threshold stress level of every leaf. In terms of the tree analogy, we know from nature that no single leaf conditions the health of the whole tree. However, in other organisms a single branch may indeed be crucial. The human windpipe, for instance, may be viewed as a branch of the respiratory system, and the respiratory system as a branch of the circulatory system. A blockage in the windpipe may lead to death within a matter of minutes. Thus, within our branched systems model of the public sector, we must make a further judgmental decision about which branches should become the focus of our measurement procedure.

Step Three-Threshold Standards:

The Adequate Public Facilities Concept (APF)

All systems can be perceived in terms of structure or in terms of process; in physical terms or operational terms. The application of this general distinction to the public sector systems divides them into two categories: facilities and services. Thus, we may conceive of the term public facilities as representing a physical manifestation, in terms of buildings and land uses; and the term public services as representing an operations manifestation, in terms of the human transactions that take place within and related to these facilities. Another common version of this idea is the separation of public expenditures into a capital budget for land and facilities, and an operating budget for services.

By focusing on the facility aspect, but with the understanding that the concrete physical symbol of "facility" is intended to represent both the facility and the service dimension, we make possible an analysis of the three major systems in which their component parts may be described in terms of land use maps and physical dimensions. This is the traditional domain of land use planning.

The APF Ordinance

In Montgomery County, eight specific facilities have been selected out of the full range of possible choices; and have been identified by ordinance as those which are to be used in a specific manner, at a particular point in the growth management process. These facilities are: water supply and sewage disposal (nature); roads and transit (transportation); and schools, police, fire and health clinics (community).

These facilities are identified in the APF Ordinance, which is an adjunct to the Subdivision Regulations. The Subdivision Regulations authorize the Planning Board, as a part of its power, to review and approve the subdivision plans of all those private properties proposed for development into smaller lots, or consolidation from small lots into larger ones. The APF Ordinance authorizes the Board to withhold approval, if a finding is made that any or all of these eight public facilities will not have sufficient capacity to adequately serve the proposed subdivision. In terms of the broader concept of carrying capacity, the exercise of this act constitutes the equivalent of making a judgement about the threshold stress level of each of the eight subsystems identified.

The act originally required the affected private land owner to assemble a written finding and opinion from each of the public agencies or departments responsible for the eight facilities named. After some experience with this process, considerable objection was raised, by both the private land owners and public agencies, over the amount of time required to be given to this process, prior to the matter reaching the Planning Board for decision. As a result, the County Council amended the ordinance to shift this burden to the Planning Board staff, who now do it as a part of its review of each subdivision application.

This shift brought further to the forefront the problem of how to measure stress levels in different systems, what level of service criteria to establish, and how to support each APF decision with a comprehensive and consistent public purpose rationale. To put this in the proper context, it is necessary to examine the role of subdivision approval in relationship to all the other decision points in the growth management process as a whole.

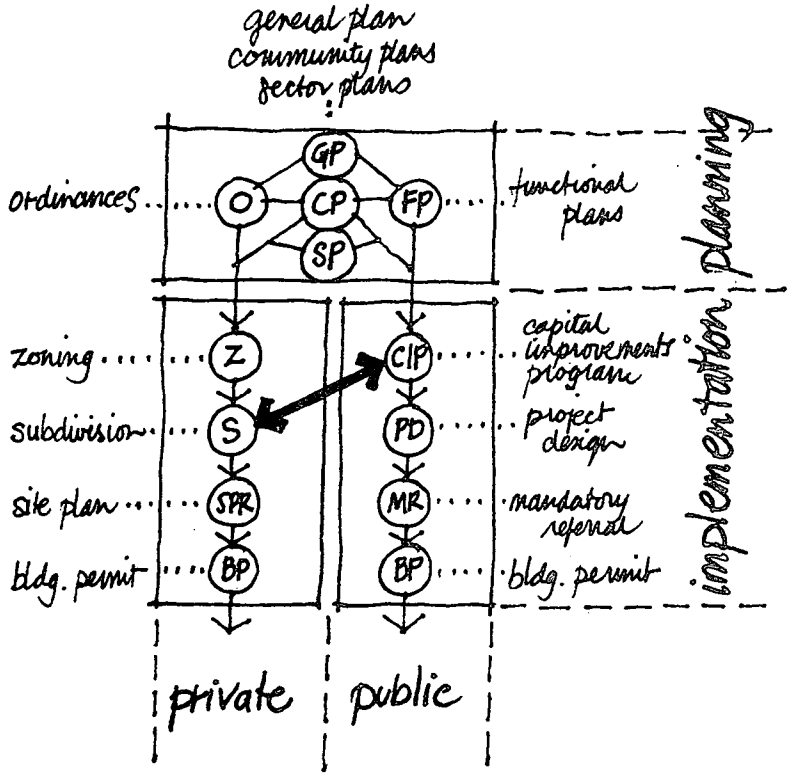
Step Four-Implementation:

The Growth Management Process Model

The Planning Board's original management process model, laid out in 1974, offers a convenient framework for this examination. The model derives its structure from a recognition of two necessary distinctions: (1) the distinction between the private sector approach and the public sector approach, based respectively on police power and purse power, as outlined earlier; and (2) the distinction between planning and implementation, with planning being an exercise that seeks to lay out guidelines for the future; and implementation being an exercise which takes place in the present, and is of a more concrete and forceful nature in creating the actual conditions that fulfill a plan's objectives. The result was the three rectangle model illustrated here.

Since the four terms, (private, public, planning and implementation), are all to a certain degree abstractions, they cannot be expected to fit the real world of events with precision. It seems reasonable, however, to assign the existing array of already developed procedures, documents, and decision points, within the three rectangular containers of this model in the manner illustrated.

Comprehensive planning includes a hierarchy, ranging from the general plan to more detailed master plans and still more detailed sector plans. Functional plans are plans that share in the comprehensive nature but have guidelines directed primarily to the public sector side. Ordinances, although not so geographically specific as the other planning documents, nevertheless, contain guidelines which deal with locational and physical land use characteristics, and which are directed primarily to the private sector side.



Although County policy implicitly expects all these tools in the planning box to be used as guides by the actors in the implementation process, the decision points shown in the implementation boxes still enjoy a high degree of autonomy. On the public sector side, the capital improvement program might include projects not contained in any plans; and frequently would omit projects that were contained in plans. On the private sector side, the zoning map designation frequently might be different from the plan proposals. It also differed from the plans in that it had the force of law, in terms of governing the actions of the private land owner.

The other implementation decisions points, shown in a linear sequence below the Capital Improvements Program (CIP) on one side, and the Zoning Map Designation on the other, represent a further hierarchical time line, along which a project, in either the public or private sector, must move in order to reach completion.

Administration of the APF Ordinance

The arrow connecting the subdivision step to the capital program step illustrates how the APF Ordinance, as adopted, gives guidance to the way in which a threshold stress level decision is to be made. Referring to our previous generic equation, that public over private equals level of service, we note that the APF Ordinance defines "public" as being any public facility, (in one of the eight facility categories), whose initiation-of-construction date has been included within the adopted six-year CIP; and it defines "private," as being any parcel of privately owned land brought to the Planning Board for subdivision approval. The question of what should constitute the threshold level, or the acceptable, or "adequate," level of service for the facility in question, was left to the Planning Board to determine on some reasonable basis.

In accepting this burden, the Planning Board continued, to a large extent, to rely on the case-by-case evaluations provided by the Board of Education for schools, and by the Washington Suburban Sanitary Commission for water and sewer treatment. These agencies do have normative standards, such as maximum number of pupils per classroom and maximum pollutant loads per unit of recipient stream flow; and the Planning Board could comment on these standards as appropriate from time to time. Similarly with regard to police, fire, and health clinics. With regard to roads and transit, however, it was necessary to establish a specific new standard, because traffic congestion had not heretofore had a minimum acceptable level of service established

in any official, systematic way for the entire system.

The Planning Board adopted a road congestion standard that identified traffic level of service 'D,' at the nearest major intersection, as the road system's minimum acceptable threshold stress level. This was a standard derived from common engineering practices of attempting to design road systems so that they will flow freely without excessive delays, jam-ups, or accidents. After administering this standard for a while, a number of issues arose which suggested a better approach. These issues, which are echoed in the other systems of the APF as well, may be characterized as constituting a "scale dilemmma."

The Scale Dilemma

The scale dilemma is a general term that covers four issues called: (1) the "pattern" issue; (2) the "equilibrium" issue; (3) the "substitution" issue; and (4) the "combination" issue.

The "Pattern" Issue

The "pattern" issue is a problem in spatial dimension. It arises from the fact that the most efficient pattern of land use activities is one in which certain activities cluster together, and others are spread out at further distances. The result is a landscape that has hills and valleys, rather than one that is a totally flat plain. It is the density and use contours of this urban landscape that give it its essential character, just as it is the contours of a person's face that make the individual recognizable as a distinctive entity.

This urban "pattern" of distinctive land use clusters and contours has an effect on the flow of traffic. In the natural landscape, streams do not flow at a constant and uniform rate, unless they flow through a constant and uniformly sloping plain. Wherever there is topography, the stream will alternately be squeezed in and speeded up, or spread out and slowed down, as a function of the contours of the land. Similarly with urban traffic. It too will experience contraction and expansion, and changes in speed, as a function of the land use densities and patterns it traverses. Characteristics of stream and traffic flows are different, but they share the effect of being influenced by the "pattern" of the landscape through which they flow.

The use of a traffic level of service standard, that requires the same rate of flow at every major intersection, implies a high degree of roadway engineering, with which to overcome the variations in flow that would otherwise be caused by the natural contours of the urban "pattern." Such roadway engineering, by building larger channels and special intersections, can attempt to compensate for the irregularities introduced by the urban landscape.

An analogy might be the Roman aqueducts, that brought water at a constant rate of flow from the hills to the cities, by cutting through the hilltops and bridging the valleys. In contemporary terms, however, such extensive roadway engineering may well be unacceptable, because of either its cost, or its detrimental effect on the organic character of the land uses around it.

It is of the essence of the growth management approach, as contrasted with the growth accommodation approach, that such trade-offs be carefully evaluated. Thus, we have characterized, as the "pattern" issue, the problem associated with the contrast between a "variable" rate of traffic flow, implied by the natural urban landscape, and a "constant" rate of traffic flow, implied by the use of a standard level of

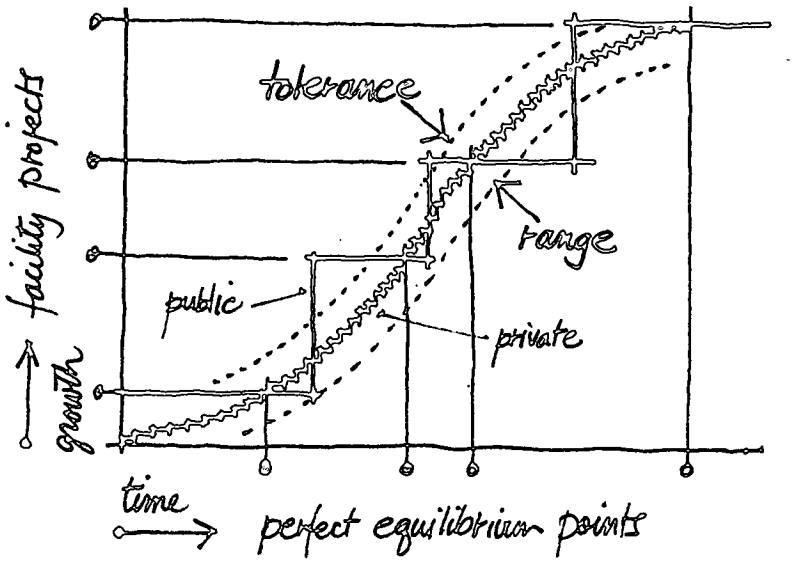
service index for every major intersection. Since the current method of implementation (i.e., dealing with each subdivision as it comes along) does not lend itself easily to a variable level of service standard (which can only be perceived by viewing the landscape at a larger scale), we have designated this "pattern" issue as one facet of the scale dilemma.

The "Equilibrium" Issue

The "equilibrium" issue is a problem in timing. It derives from the observation that the increment of growth associated with each subdivision is frequently much less than the increment of growth associated with each new public facility, especially roadways. As a generality, one new elementary school accommodates more children than are generated from a single new subdivision, and certainly this is true for junior and senior high schools. Similarly, a single police or fire station, or health clinic, will serve a considerable area. A major arterial road or freeway can accommodate the traffic generated by many such developments, and a really large sewer trunk line or rapid rail line can accommodate a very large area.

Thus, the growth curve for private development is relatively smooth, being composed of small increments of change; whereas the growth curve for public facilities is very "lumpy," being composed of large increments of change. As a consequence, the points of perfect equilibrium between the private sector need, and the public facility capacity, tend to be limited to very short periods of time, so long as there is any significant degre of growth taking place.

Recalling that the term "public facility" is used herein as a surrogate for the larger concept of facility plus service, we recognize that public facilities can shrink and enlarge in their service capacity, through changes



in personnel complements and other operational characteristics, without necessarily changing the size of the physical plant. Thus, there is a degree of flexibility associated with the definition of the term "facility capacity." However, the problem of how to measure the equilibrium point in time still remains.

A way of dealing with this problem could be to use the concept of a "tolerance range," or an acceptable degree of deviation from the precise fit that would be required by strict adherence to a constant level of service standard. Such a tolerance range tool is difficult to use, however, within the current framework of the APF Ordinance. The application of the Ordinance to each subdivision makes it difficult to deal with a tolerance range larger than the size of the smallest subdivision. While not insurmountable, this problem does pose sufficient problems of measurement and methodology to warrant the search for a better approach. Thus, it is identified here as the "equilibrium" issue, constituting another facet of the scale dilemma.

The "Substitution" Issue

The "substitution" issue is a problem in the dimension of human behavior. It could be regarded as a socio-economic dimension. It derives from the fact that people may chose to shift their behavior when faced with a significant constraint in a given urban system. In transportation, the major substitution effect is found in what is called the "modal split," between auto and transit travel. If public transit is available, people may substitute this subsystem of the overall transportation system, for the previously used subsystem of roadways. This substitution effect will impact the level of service experienced on the roadways, measured in terms of vehicle congestion. A shift in the "modal split," towards a greater percentage of total trips using transit can result in the total transportation system increasing its carrying capacity, without any change in the level of service experienced on the roadways.

If congestion on the roadways were to become bad enough, people might go beyond the substitution effect, and even reduce their consumption in absolute terms, by foregoing certain trips; or they may combine trips, that previously were taken separately, into one combined trip. Also, they may shift the timing of some of their trips so as to avoid the peak hours.

Montgomery County's situation has not yet reached congestion levels high enough to suggest any major induced reduction in total trips, as a derivative of road congestion alone. It is possible that such constraints may be felt in the future, if the supply of gasoline is constrained sufficiently through some form of rationing, or extremely high pricing policies. In terms of current growth management policies, the major outcome of this substitution effect is the probable shift from auto to transit, when the full transit system is finally in operation.

The "substitution" issue composes another facet of the scale dilemma, because the "modal split" is a statistical measurement that is most dependable when applied to a larger area. As in the case of the "equilibrium" issue, it would be desirable to introduce the concept of a tolerance range to accompany this statistical measurement. Although it would be possible to treat each subdivision differently with respect to its "modal split" assumption (e.g., based on differences in auto ownership, proximity to bus lines, etc.), it poses some problems of methodology that seem handled better at a larger scale. Thus, the "substitution" issue comprises another facet of the scale dilemma.

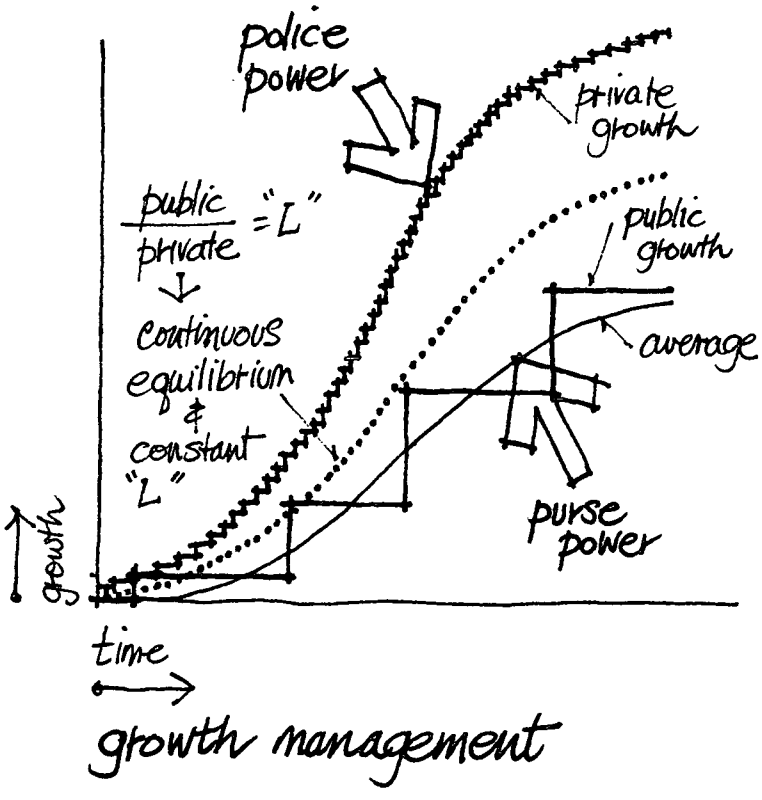
The "Combination" Issue

The "combination" issue is really an extension of the "substitution" issue. At some point, the effect of constraints on major systems of the urban fabric will produce behavior shifts that cross over into other major systems. This is an aspect of human behavior that seems to go beyond the simple marginal substitution of goods and services, that is dealt with in the science of economics. It is, therefore, more difficult to understood or measure.

The "combination" issue addresses the total cumulative impact, on the resident population, of many relatively small changes in each of various subsystems of the urban fabric. It is possible, in certain situations, that the changes in any individual subsystem would not be excessive in terms of that system alone, but combined with the simultaneous happenings in all the other systems, might result in an aggregate impact of significant dimension. Alvin Toffler has described something similar to this as "Future Shock." Many small chains of cause-and-effect need to be explored in order to really measure this phenomenon.

Some local examples might be: changes in fiscal policy that reduce the hours of operation of community facilities, such as schools and libraries, thus shifting more trips onto the peak hour of the transportation system; or, constraints in sewerage capacity precluding private development investments that would yield fiscal and economic benefits to the County.

The present APF Ordinance does allow for a judgment to be made about this combination effect among the eight public facilities identified. To the extent that it may be easier to identify such combination effects at a larger scale than the single subdivision, the "combination" issue becomes another facet of the scale dilemma.



growth management

The Comprehensive Staging Plan Approach

Assuming that existing County policy intended the APF approach to be seriously implemented, the Planning Board brought the matter of this scale dilemma to the attention of the County Council; and outlined what appeared to be a logical approach to its solution. This was called the Comprehensive Staging Plan (CSP) Approach. It was endorsed for further refinement and adoption in 1979.

In essence, this approach would attempt to resolve the scale dilemma by enlarging the size of the private sector growth increments, to a magnitude more in scale with those on the public sector side. By doing this, the four aspects of the scale dilemma can be handled in a more manageable and reliable manner.

By using larger spatial areas than those confined to a single subdivision, it is possible to take account of the natural variations in traffic flow that derive from the urban landscape pattern.

By clustering together larger increments of private growth than those contained in a single subdivision, it is possible to measure private sector increments against public sector increments, so that both sides are relatively in scale with each other. In this way, it is possible to use the tolerance range idea, as a qualifier on the level of service measurement; and thereby approach the dynamic equilibrium problem in a more balanced way.

This larger dimension, in space and time, also is more in scale with the statistical analytic techniques required by the "substitution" issue. In effect, this shifting of the focus of the measurement microscope, so as to work at a coarser grain, can increase the statistical

reliability of the results.

And, finally, the shift to a larger scale on the private sector side also can provide benefits of increased perspective, with which to pick up any significant impacts derived from the "combination" effects.

The Comprehensive Plan Proposal

Several conclusions flow directly from the concept of clustering up the increments of change on the private sector side to a larger scale:

(1) The level of service measurement must be made on the basis of some future point in time, rather than the present. This involves the simulation of future conditions, and their expression in terms of a planning document, which reaches ahead and sets normative standards for some end-state situation in the future;

(2) Such a plan, because it involves a comprehensive judgment about future conditions, and their combination cross over impacts, should only be adopted after public hearing and due process of consideration;

(3) Such a plan, because human efforts at simulating the future are necessarily imperfect, should be subject to monitoring and modification at periodic intervals of time;

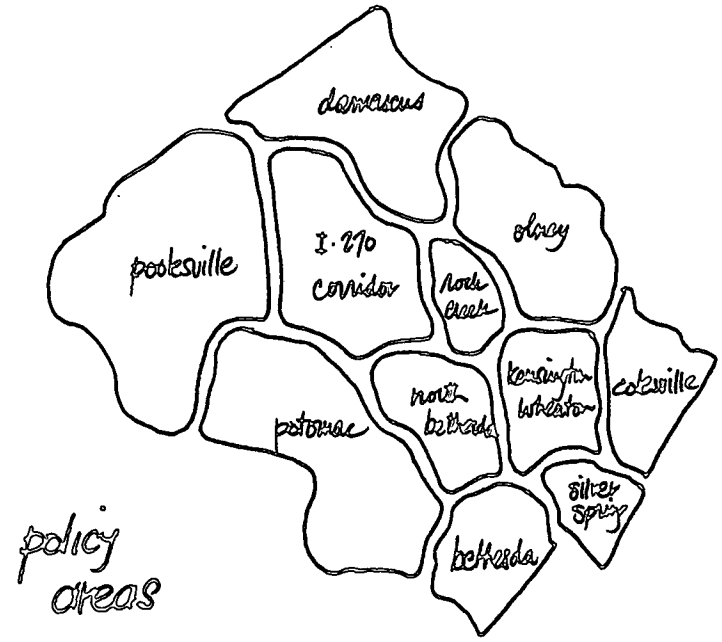
(4) Such a plan, in order to be effective, must be hooked by an implementation technique, to the private sector side of the growth management implementation process, and, in particular, to the subdivision approval process;

(5) Such a plan, since it not only simulates future private development, but also future public development, should be linked, in some meaningful way, to the public sector implementation process of programming and budgeting for public facilities.

The CSP that is presented in this document satisfies these five criteria, as described briefly below.

(1) Normative End-State Description

In essence, the plan divides the County into what are called "policy areas;" and uses these areas, as well as various subareas within them, as the basic geographic units for level of service analysis. For each of these policy areas, or subareas, the plan establishes a set of interim threshold levels for private sector growth.



These thresholds are expressed in terms of both residential dwelling units and non-residential units, the latter being described as a number of jobs or a square footage of floor area, so that together they cover all kinds of private sector growth. These threshold levels constitute intermediate levels between the amount of existing development in the policy area, and its ultimate final holding capacity under current adopted zoning maps and master plans.

These interim threshold levels are established through a process of identifying a necessary set of additional public facility projects, needed to fulfill the end-state requirements of the master plans. This set of capital improvements projects is then arranged in a linear priority sequence, reaching from the present into the future. By using some established standard for the minimum acceptable level of service, as a normative guideline, a private sector growth threshold can be derived, which constitutes the maximum additional growth that can be accommodated without exceeding this guideline.

These interim thresholds then are labelled Stage 1, Stage 2, Stage 3, etc., corresponding to public facility Project 1, Project 2, Project 3, etc. In this way, the plan clusters up the small scale increments of private growth into clusters that are in scale with the size of the public facility projects; and expresses the APF relationship, between the private and public sector growth, through means of a set of normative end-state conditions, called "Stages."

By performing the APF measurements at the spatial scale of the policy area, or subarea, and the timing scale of the public facility project, the plan is able to capture the statistical benefits described earlier in the "equilibrium," "substitution," and "combination" issues. By using different minimum level of service standards for different policy areas, where there is justification to do so, the plan also can take account of the "pattern" issue. In this way, the CSP takes into account all four issues within the scale dilemma.

(2) Due Process Adoption

The plan should be adopted after public hearing and discussion, as an amendment to the existing General Plan of the County, the Wedges and Corridors Plan. This original General Plan envisaged that a staging element would be developed for it. Now, fifteen years later, it seems that the necessary technical ability to implement this idea finally is at hand.

(3) Monitoring and Amendment

The plan should be officially reviewed every two years, with provisions for an intermediate review in the intervening years, and such ad hoc amendments as may prove necessary from time to time. A two-year period for measuring small changes in human behavior is about the right balance between excessive paperwork and inadequate detection. It also fits symmetrically within the four-year term of office of the elected officials of the County.

(4) Private Sector Guidance (i.e., Regulating)

The only feature of the plan document to be officially adopted should be the first stage threshold level for each policy area, or subarea. The rest of the plan document should be thought of as supporting rationale and background information, including the threshold levels in the stages beyond the first. By adopting only the Stage 1 threshold, it is possible to amend the sequence of public facility projects, as may be dictated by other considerations, and come back to modify the second, third, or fourth staging thresholds accordingly.

The Stage 1 thresholds proposed in this CSP are based on the road and transit projects contained in the currently adopted six year CIP.

The Stage 1 threshold level, as the effective adopted guideline of the CSP, should constitute a firm ceiling, above which no private sector APF approvals would be given, unless and until an amendment to the CSP has been adopted. The Planning Board, in performing the APF test at point of subdivision approval, would be able to accept subdivisions on a first-come-first-serve basis, up to the point of reaching the threshold.

By retaining the existing APF Ordinance, the Planning Board would still have the statutory authority to undertake a more detailed analysis, if there were reason to believe that the subdivision in question constituted some kind of unique or special case. But it would be assumed that, in effect, the burden of proof would be on the Planning Board to show how this special situation was relevant. In general, it would be assumed that the comprehensive legislative judgment, involved in adopting the CSP, would prevail, in the same way that the comprehensive judgment of an adopted master plan is assumed to prevail, with respect to a zoning map amendment, unless there are unusual circumstances.

The difference between the master plan situation, and the CSP situation, would lie in the fact that the master plan is not legally or administratively binding on the zoning map amendment decision, (although the Montgomery County Council has given the master plan greater weight, by adopting a local resolution that requires an extraordinary five-to-two vote before the zoning recommendation of the master plan can be overturned, unless there is also a recommendation of approval from the Planning Board).

Unlike the master plan situation, it is proposed that the adopted Stage 1 thresholds, of the CSP, would be used administratively by the Planning Board as a binding guideline to the maximum amount of private growth permissible without an amendment to the CSP. Since the CSP would be officially reviewed, and possibly amended, every two years, the CSP would always be relatively current. This is not the situation with master plans, which are reviewed and brought up-to-date generally at five to ten year intervals, and sometimes longer.

In addition to the CSP threshold guidelines being implemented through the subdivision process, it is proposed that an appropriate ordinance amendment be adopted, which requires that no building permit be approved, until or unless it had received a prior APF approval from the Planning Board. The addition of this requirement will not lay additional burdens on any developers for whom subdivision was already a requirement, because, by passing the APF test, at the time of subdivision, such developers will automatically be fulfilling this new building permit requirement. What the amendment will do, is to bring that relatively small portion of the total private sector growth, which does not now require subdivision approval, under the APF review.

This implementation amendment is the counterpart of the proposal, cited above, to express the staging thresholds, not only in terms of residential dwelling units, but also in terms of nonresidential employment, or floor area, characteristics. The two together would extend the coverage of the APF idea to the full range of private sector growth. This would complete the implicit policy intention of the APF Ordinance, that it be applicable to all growth rather than simply residential growth.

The CSP would amend or incorporate such staging guidelines as are now contained in the relatively few master plans which have been adopted with such elements. Future master plans could continue to address staging issues as appropriate, but the effective implementation of their guidance would be through incorporation of their proposals into the CSP, through the CSP amendment procedure.

Public Sector Guidance (i.e., Budgeting)

It is proposed that the CSP be binding only on the private sector implementation process, for reasons which are outlined more fully later in this chapter. But, although not adopted as policy, the background elements of the plan document nevertheless can be very useful, in making decisions about the public sector implementation process.

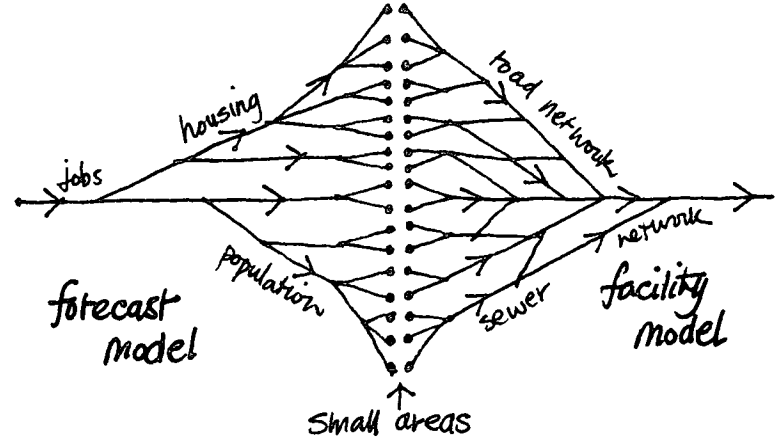
For instance, the monitoring of how much actual growth is approaching the threshold ceiling can provide an early warning of how much pressure is building up on the existing public facilities in a given area. Also, the CSP's proposed sequence of public facility projects, beyond Stage 1, can be useful input to the CIP, although other considerations, such as engineering problems, intergovernmental funding, or fiscal constraints, may dictate some revisions to this sequence. Similarly, the incorporation of a long-range private sector growth forecast in the plan document can be a useful scanning device, to use in performing "investment risk analysis," as a part of decision-making about the timing of public facility projects.

The CSP Format

The format of this present report is a model for the future ones. The use of the five chapters, called "Framework," "Facilities," "Forecast," "Fiscal," and "Focus," derives from the logic of the planning procedures necessary to arrive at the threshold conclusions. In order to understand the relevance of these sections to the overall growth management process, it is important to appreciate a few key features about these planning techniques.

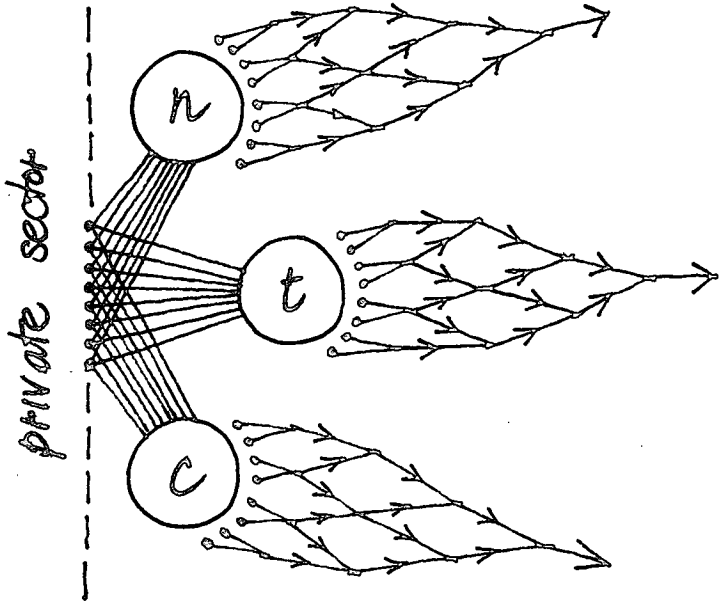
Simulation Models : Facilities, Forecast & Fiscal

We have established thus far that the CSP approach requires: (1) the ability to simulate future conditions among both the public and private sector systems of the urban fabric growth model; and (2) the corollary ability to measure and portray systems data by subareas of the County, in such a way as to allow comprehensive judgments to be made, about the crossover repercussions of one system on another. The Planning Board staff have now essentially completed the integration of a number of computer techniques that allow this to be done. They may be described under three general headings: (1) "Facility Models," (2) "Forecast Models," and (3) "Fiscal Models."



Facility Models

The term "facility models" refers to a set of simulation models, that have been developed for a number of the public facility subsystems. These mathematical models simulate the real-world workings of such urban subsystems as the sewer networks, the highway network, and others. A more complete description of these models is contained in Chapter 2, "Facilities."



It is explained there how the Planning staff analyzed a sketch model of the relative sensitivity to stress, of all the public sector systems in Montgomery County; and concluded that, for Montgomery County, the most sensitive subsystems were: (1) the sewerage system, (2) the transportation system, (3) the fiscal system, (4) the school system, and (5) the stream valley park system, in roughly that order of priority. Environmental protection constitutes a special sub-section of this facility modelling approach, and has been taken into account, as is explained in Chapter 2. Computerized simulation models were then developed for the sewerage system, the transportation system, and the fiscal system.

The analysis of relative sensitivity to stress among the subsystems concluded that, while sewerage may be the most important constraint today, the next most pressing is transportation. Thus, a technique was developed whereby private sector growth, expressed in terms of jobs, housing units, and population, can be allocated by small areas, which relate logically to both the sewerage system and the transportation system.

From this emerged two basic spatial areas for the measurement of growth--one called a sewer shed and one called a traffic shed. Sewer sheds are data containers that relate to the sewer pipe network; traffic sheds are analogous with respect to the road network. Through these techniques, it is now possible to transfer the results of a growth stress simulation in the transportation system into its effects on the sewerage system, and vice versa. By expansion, it is possible to add other subsystems into the software for this program.

Focussing on the transportation system, it has already been mentioned how the "pattern" and "substitution" issues both apply strongly to this system. Accordingly, a level of service standard has been developed for the transportation system, that explicitly takes into account both of these issues. It does this by modelling the "substitution" effect of the transit system, and, from this, deriving a level of service for roads, which differs by subareas of the County, thus integrating a response to the "pattern" issue.

Specifically, this takes the form of identifying subareas of the County, in which significantly different levels of transit service will become available, when the full transit system currently under construction is completed. The judgment is then reached that a higher level of congestion on the road network (i.e., a lower level of service) can be accepted for areas that have a higher level of transit service available, and vice versa. This leads to the establishment of four levels of acceptable roadway congestion, identified as Levels I, II, III, and IV, ranging from the least to the most available transit service.

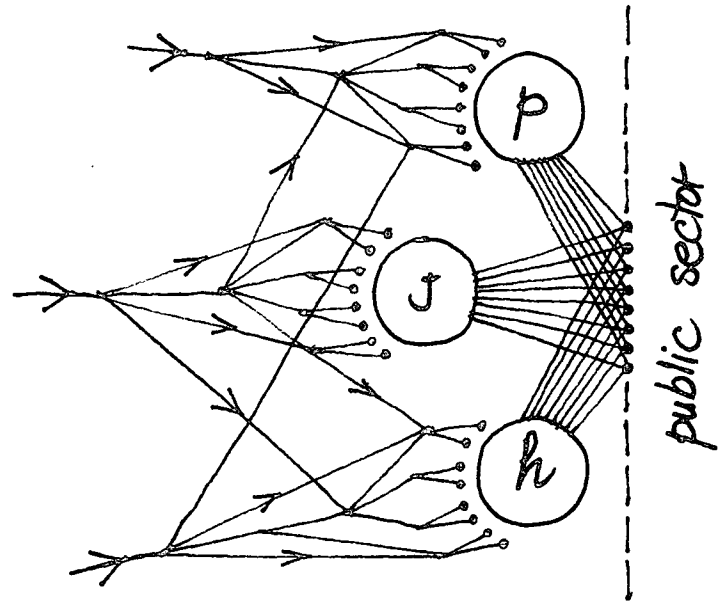
It also leads to the establishment of areas larger than traffic sheds, which relate logically to the geographic scale of this difference in level of transit service. These larger areas, called "policy areas," are made coterminous with both aggregations of traffic sheds, and aggregations of master planning areas. They then can be used as the basic geographical unit for which to set policy thresholds on private growth, with these thresholds in turn keyed to, or triggered by, additional increments of roadway capacity. Staging thresholds by policy areas, thus become defined in terms of the maximum number of additional dwelling units, and/or non-residential space, that can be added to the policy area, until such time as another increment of the road or transit network has been added to the CIP.

Although the actual thresholds proposed, in this current staging plan recommendation, are keyed to the transportation system, the overall CSP approach can accommodate thresholds derived from the constraints of other systems such as the sewerage system, the fiscal system, the school system, etc. The current recommendations explicitly incorporate normative standards for both transportation and sewerage. Chapter 2 describes the sewerage model and the nature of the major constraints it is currently facing, as well as proposals for dealing with these, so that they do not remain the single constraint on future growth.

In future years, it is possible to add further normative standards for the fiscal system, or the school system or others, depending on desirability and feasibility as determined after further study.

Forecast Models

The term "forecast models" refers to a set of simulation models that have been developed for each of the three private sector systems, called "People," "Jobs," and "Housing." Since governmental visability into the workings of these private market systems is relatively restricted, as well as for several other reasons related to the nature of these activities, these models are necessarily different in character from those for the



public facility systems. Hence, we call these simulation models "forecast models," and use them with the understanding that there is a considerably higher degree of uncertainty associated with their product, than with the product of the facility models.

A method of attempting to reduce this uncertainty has been developed, called "Cooperative Forecasting." By using the Council of Governments (COG) as a common forum in which all the planning staffs of the member jurisdictions can review and critique each others estimates, it is possible to get a better perspective on such elements as jobs, than would be possible for one jurisdiction working alone.

This process has just produced a revised forecast, which lowers slightly the growth expectations outlined in the 1976 forecast. Details are outlined in Chapter 3 of this report. The new forecast also contains an official recognition by all the member jurisdictions of the COG, that forecasting involves a high level of uncertainty. It is recognized that the way to deal with this is to produce a high, a low, and an intermediate set of forecasts, so that the range of uncertainty may be given some degree of definition. This range of uncertainty concept is important to the way in which the CSP is used and understood.

Facility/Forecast Model Comparisons

Facility models basically attempt to duplicate the flow of processes through a real world system that exists in the present. If the model is successful, it allows the operator to simulate the effect of changing a number of system conditions, all within the same time framework. Typically, such models are calibrated so that their results, when fed current condition data, will correspond to the present or past real world results of the actual system itself. Once they have been so calibrated, they may be expected to produce reasonable results when applied to potential future conditions, provided that not too much change takes place in certain fundamental characteristics of human behavior.

By contrast, forecast models, which deal with private sector activities about which less is known, are difficult to calibrate against existing situations. Essentially, they deal with the extrapolation of current trends into the future. Inherently, therefore, they have a much higher degree of uncertainty associated with their reliability, than do facility models.

In order to simulate the level of service conditions that realistically are expected to apply to a future time, it is necessary, in effect, to multiply a facility model by a forecast model. That is to say, the distribution of future jobs, dwelling units, and people, resulting from the forecast model, is used as an input to the facility model, which in turn simulates the operation of the system; and results in a measure of its level of service under those conditions.

Both facility models and forecast models are variants within the general field of systems analysis, a field which heavily involves statistical techniques. As such, they both incorporate a degree of uncertainty, as characteristic of all statistical exercises. But because the facility model has a higher degree of reliability than the forecast model, it logically follows that the major portion of uncertainty, associated with a level of service conclusion for some specific future date, is a derivative of the uncertainty associated with the forecast.

Because of these differences between facility and forecast models, it is necessary to make a distinction in the planning process, between the use of models to

analyze alternative possible future conditions (i.e., "forecast" mode), and the use of models to establish policy thresholds derived from normative standards (i.e., "normative" mode). It is one thing to test the level of service impact on a system, resulting from some future growth scenario; and it is another to establish a private growth threshold, constituting the maximum carrying capacity of that system under some normative level of service standard. To the uninitiated, the distinction may sound academic. It is important to mention it here, only to forestall public confusion about the difference between a growth forecast and a growth threshold.

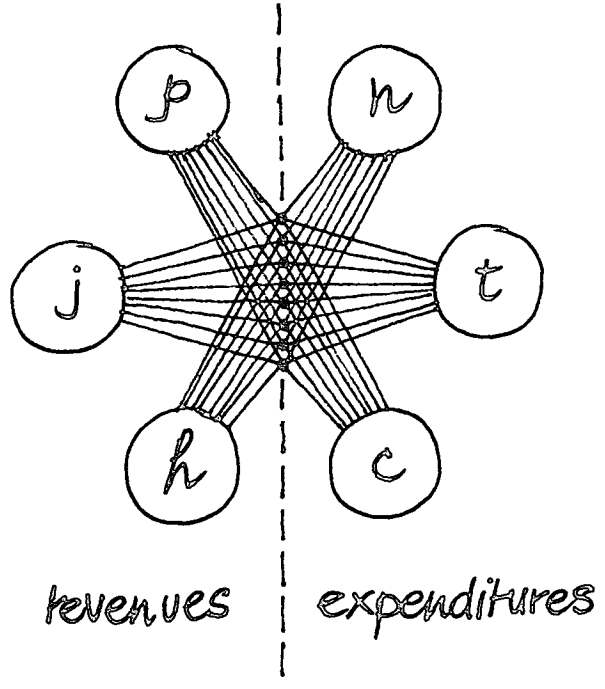
The growth threshold represents an end-state condition of both the private and the public elements of the urban fabric, that is balanced with respect to some level of service standard. It has validity independent of the actual timing of its occurrence. It is used in the growth management process as ceiling, or brake, placed on private growth through the police power, to prevent that growth from upsetting this level of service balance.

A growth forecast is an estimate of the private growth that will be produced by market forces, by a certain target date in real world time. Such a forecast might be over or under the acceptable growth threshold. In preparing growth forecasts, the Planning staff include recognition of the spatial ceiling constraints set by zoning, and assume that market growth will not exceed these. But they do not include the staging thresholds. Rather they ignore them; and seek to simulate what the market forces will produce if unconstrained by such thresholds.

The value of keeping these two simulation exercises separate, is that it allows the planner to compare and contrast the timing aspects of private sector needs, with the timing aspects of public sector supplies. Thus, the major use of the facility models is to establish the appropriate private growth thresholds, based on whatever is the current or proposed sequence of public facility projects in the Capital Improvements Program (CIP). The major use of the forecast model is to provide insight as to how soon the market forces may reach that private growth threshold; and whether it is, therefore, desirable to speed up or slow down the pace of the CIP

The Fiscal Models

By contrast with the facility models, which cover only the public sector elements of the urban fabric, and the forecast models, which cover only the private sector elements of the urban fabric, the fiscal models cover both.



Heretofore we have been discussing a growth management process, in which the question has been the ability of the public sector to absorb the effects of growth in the private sector. At this point, we shift our attention to the reverse of this proposition, namely, the ability of the private sector to withstand the growth of the public sector, growth which, in turn, has been generated by the growth in the private sector.

Thus, while stress measurement in the fiscal system uses similar models to those used in the other systems, it must be recognized that the flow of impact, from private to public, has been reversed. Fiscal impact assessment in this sense is the reverse side of the coin from public facility impact assessment. Both are essential components of the full carrying capacity concept; and both should be weighed together in a composite judgment about a CSP.

The Planning Board staff have developed a computerized fiscal simulation model, using the six basic elements of the growth model, as well as the subsystem modelling components of the facility and forecast models. Using this model, it is possible to simulate the relative stress effect on the tax rates of the County, under varying alternative conditions in both the public and the private sectors.

This fiscal model is essentially a cost/revenue model. It arrays the public revenues, derived from the private sector element, through property taxes, income taxes, rates, fees, etc., against the public expenditures, necessary for the public sector elements of public facilities and services.

It is essentially a simulation model similar to the facility models, in that it duplicates the flow of processes through a real world system that operates in the present. Like the facility models, it can be multiplied by a forecast model to produce a simulation of future fiscal conditions, with all the uncertainties attached thereto. Like the facility models, it can be used with greater reliability to answer "what if" questions (i.e., if some future condition comes about, what will be the fiscal impact?).

The model has been used in the development of this CSP, only in the "forecast" mode. It was used to assess the fiscal impact of the combinations of private and public growth associated with the forecasts that were used to develop the thresholds established herein. The results of this exercise are described in Chapter 4. In general, these results showed that the present tax rate would be quite adequate to support the public facilities associated with these growth thresholds, given certain key assumptions about the character and location of the private sector growth. Inflation effects were removed from the study by using constant dollars.

The model can be used also in a "normative" mode, to establish threshold levels of growth keyed to certain fiscal, level of service standards. This would require some additional work beyond that accomplished thus far, especially in the area of establishing maximum acceptable stress levels. Because the fiscal model simulates a system that has almost no geographical or physical constraints, and one which is brought into balance once a year, through the exercise of the budget and tax rate designation, it is far less subject to the scale dilemmas of the "pattern" issue or the "equilibrium" issue than the facility models.

Also because its unit of measurement, money, is commonly used as a measure of a number of other values in human behavior, the fiscal model is less succeptible to scale dilemmas arising out of the "substitution" and "combination" issues. Consequently, the fiscal model can be used to measure the relative impact of small increments of growth with some

greater reliability than can be achieved with the facility models.

In summary, the fiscal model provides a useful tool, that can be used to further refine the growth management process in the future. It is included as a separate section, in the format of the CSP, because it serves two functions.

(1) Like the facility models, it can be used in a "normative" mode to arrive at a private growth threshold designation. Whereas the facility model process reaches toward this designation, by measuring the impact of private growth on the public sector, the fiscal model reaches toward this designation, by measuring the impact of public growth on the private sector. The natural forces at work behind these two different perspectives will tend to produce conclusions, on each side, that are in conflict with each other. It is the function of the CSP adoption process to resolve this conflict, by making a composite judgment about which level of service standard to use in deriving the thresholds.

(2) Like the forecast models, the fiscal model can be used in a "forecast" mode, to help in making decisions about public growth rates, through the programming and budgeting process. In this role, the fiscal model can be used as a scanning device to assess the degree of "risk" involved in the relative timing of the construction of public facilities, by estimating the potential of revenue available at different points in the future. The desirability of conducting such investment "risk" analysis, before committing major public works projects, becomes increasingly self-evident in the current climate of concern over high inflation rates.

The Staging Chart Technique

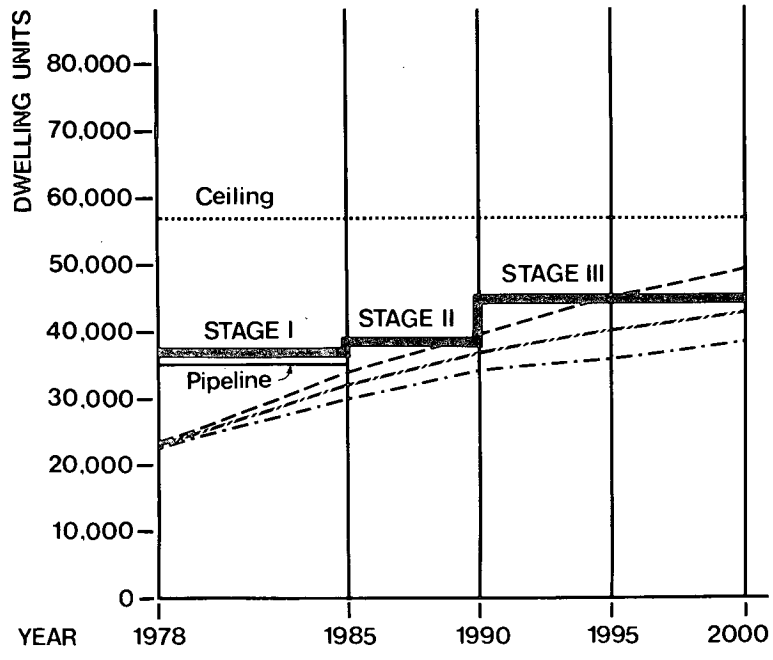
All three of the above planning elements, labelled "Facility," "Forecast," and "Fiscal," can be brought together in a simple visual format that we call the staging chart technique. Such a chart has been constructed for each of the policy areas of the County, as well as for various traffic shed areas within them, as appropriate.

As illustrated, each chart portrays the current private sector growth forecast, with its range from high to low. It also shows the end-state holding capacity, under the zoning and master plans, in the form of a line called the "ceiling." Contrasted with these, is the "pipeline" of development permit applications. This is the total amount of development, expressed in dwelling units, that has received a preliminary sewer capacity allocation, but has not yet reached completion of constructon and occupancy.

The chart portrays this information in both graphic and tabular format. In this way, each policy area can be summed up in a glance, with respect to how much residual holding capacity it retains, how fast it is expected to develop under an unrestricted market, and how much actual commitment by private developers has already occurred.

By dividing the future into five year time intervals, it is then possible, through facility modelling analysis, to position growth thresholds, and their necessary supporting public facility projects, in such a way as to keep the level of service either constant or at whatever standard is desired. The illustration shows roadway projects, since the current plan proposals are built on the basis of roads being the critical public facility system. If

I-270 POLICY AREA



ADDITIONAL DWELLING UNITS (Cumulative)				
Ceiling	34,000		Pipeline	12,221
	1978 - 1985	1978-1990	1978-1995	1978-2000
High	11,100	17,400	22,750	27,150
Inter.	8,400	13,350	17,000	20,000
Low	6,600	11,000	12,650	14,650
THRESHOLDS				
Dwellings	13,000	16,000	23,000	23,000
Employment (Square feet)	3,500,000	5,500,000	5,500000	5,500,000

GAITHERSBURG TRAFFIC SHEDS

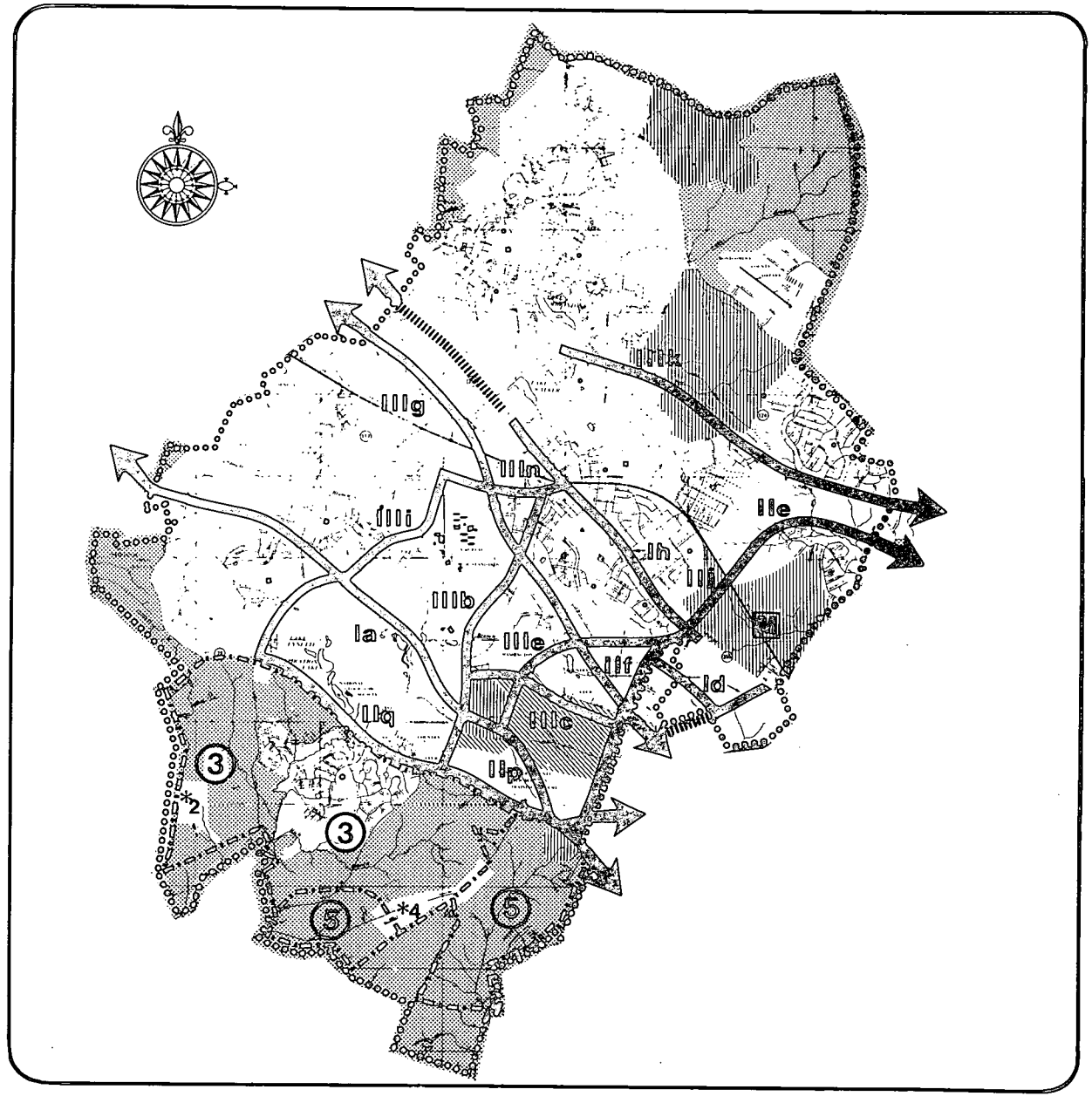
Stage		Roadway	State or County	Estimated Cost	Limits
I*	(a)	Great Seneca Highway	(C)	$19,527,000[1]	Middlebrook Rd to Md Rt 28
	(d)	Fields Road	(C)	$1,000,000	Piccard Dr to Md 355
	(d)	Gaither Road	(C)	$3,130,000	Shady Grove Rd to Fields Rd
	(h)	Route 355	(S)	$13,425,000	Shady Grove Rd to Mont. Village Av
	(f)	Shady Grove Rd.	(C)	$750,000[2]	Md 28 to Md 355
II	(p)	Rt. 28 Relo.	(S)	$8,240,000[2]	I-270 to Muddy Br Rd
	(q)	Rt. 28 Widening	(S)	$8,820,000[2]	Muddy Br Rd to Quince Orchard
III	(b)	Muddy Branch Rd.	(C)	$8,095,000	Md 28 to West Diamond Av
	(c)	Fields Road	(C)	$2,867,000	Muddy Br Rd to Shady Grove Rd
	(g)	I-270 Widening & Interchanges	(S)	$81,000,000	I-270 Spur to Md 118
	(i)	Quince Orchard Rd.	(S)	$6,930,000	Md 28 to Clopper Rd
	(j)	I-370 Connector	(S)	$19,670,000	I-270 to Shady Grove Metro Station
	(e)	Intercounty Connector	(S)	$80,000,000	Md Rt 28 to Georgia Av
	(k)	Eastern Arterial	(S)	$26,911,000	Mont. Village Av to Rt 28
	(n)	West Diamond Ave.	(S)	$5,180,000	Quince Orchard Rd to Rt 355

[1] Total Project Cost
[2] Source: Montgomery County Critical Highway Needs (1979-1998) for Secondary System by Md DOT

*Included in current State or County Program for Construction

NOTES

GAITHERSBURG POLICY AREA

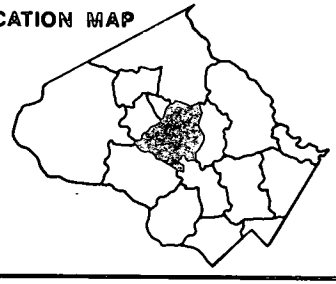


SEWER SERVICE CATEGORY

- S-1 & S-2
- S-3
- S-4
- S-5
- S-6
- *5 COMMUNITY SERVICE AREA
- *4 PROPOSED SERVICE CATEGORY

- POLICY AREAS & TRAFFIC SHEDS
- PROPOSED SERVICE AREA
- Ia ROADWAYS PROGAMMED FOR CONSTRUCTION
- IIb PLANNED ROADWAY
- M METRO

LOCATION MAP



another system were to be used as the critical one, the projects identified would be in terms of that system (e.g., sewer pipe extensions). An estimate of the approximate cost, in current dollars, of these facility projects is included.

Finally, the chart includes a map of the policy area, showing the roadway improvement projects, or other facility projects, upon which the thresholds of growth are triggered. The map also includes boundary lines, which delineate various staged categories of sewer service provision. These sewer service area categories use the same units of measurement as those in the state-mandated Ten Year Water Supply and Sewerage System Plan (i.e., Categories 1 through 6, covering time increments of one to two years, three to six years, seven to ten years, and beyond ten years). The inclusion of the sewer service area categories makes it possible to make conversion translations back and forth between the sewerage system and other public facility systems, such as transportation.

It is clear that the portrayal of threshold levels, by five year time increments, on a real time scale, involves making a number of assumptions. The first is an assumption about the minimum acceptable level of service standard. The second is an assumption about the pace of public facility construction under the CIP. The charts in this document have assumed that various clusters of roadway projects will be programmed in five year groups, such as to support the private growth threshold shown for the same five year groupings; and they have assumed a certain level of service standard, as described in Chapter 2.

Obviously, these two assumptions may not hold, as the future unfolds its turbulent way into the present; and indeed it is the thesis of the CSP that the instrument should be used to constantly update, and monitor, and make decisions, as an iterative process. Therefore, the only thing that should be adopted, as part of the periodic revision of the CSP, is the first stage private growth threshold for each policy area or subarea, which by implication includes the level of service standard used to derive it. All the rest of the document should be viewed as being useful guidance information, but not binding.

In summary, the staging chart technique provides a simple visual device, which becomes the focus of the bi-annual CSP review. It constitutes an easy reference document, which can be used both for controlling the private regulatory process, which uses the police power; and for influencing the public budgeting process, which uses the purse power.

Some Regulatory Implementation Details

Accounting Techniques and the Equilibrium Issue

In the past, there have been questions raised, about how to count previously approved, but still uncompleted, development projects, in making the APF decision on new permit applications. Specifically, this question revolves around whether the Planning Board should continue with its current practice, of including only those previously approved projects which have gone on to receive subdivision record plat approval, or whether it should also include all the projects that have simply passed the preliminary subdivision approval stage.

The latter of the two is the more stringent measure. Its use is likely to produce results that fall short of using all the available facility capacity. This is due to the fact that some projects inevitably encounter delays, for various private reasons, and do not proceed to record plat stage for long periods of time. If the facility capacity reserved for these dormant projects is then denied to another developer, who is ready to proceed, an equity problem may be perceived by the courts. For this reason, and in the light of some relevant Maryland court opinions, the Planning Board currently counts only the outstanding record plats, in addition to existing development and the new project under consideration, in making its APF decisions.

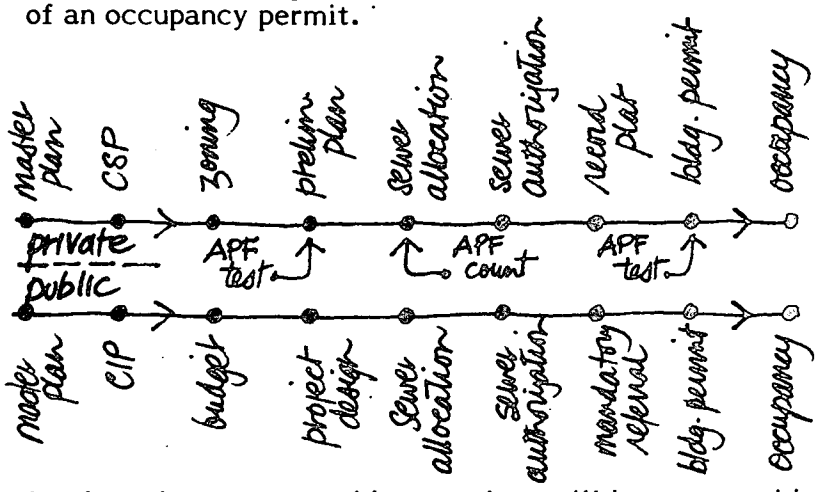
This question has to do with the "tolerance range" idea, expressed previously in discussing the "equilibrium" issue. In effect, the Planning Board's current procedure, of counting only record plats, does allow for some private growth to take place beyond that which would otherwise be allowed, under a strict application of the normative carrying capacity standard. This "extra" growth, which we call the "float," theoretically can be used as a measure of the size of the "tolerance range" above the "equilibrium" point. Under this interpretation, the Planning Board is, in effect, using the top of the "tolerance range" (as defined by the size of the "float") as its normative threshold standard.

The shift to the CSP produces a few changes in these implementation details, but maintains the same general approach. These changes are best described by placing them in the context of a diagram that illustrates the two different time lines of development in the public and private sectors.

Implementation Scheduling Issues

In terms of our growth management process model, both private development and public development are guided by the adopted master plans. But beyond this, they each travel a slightly different linear path of sequential decision making, that culminates in a completed project.

On the public sector side, a project must first be approved under the six-year CIP; then receive actual funding through annual budget approval; then undergo project design; then mandatory referral by the Planning Board; then building permit approval; and finally receipt of an occupancy permit.



On the private sector side, a project will have to avoid exceeding the threshold established by the CSP, and be in accord with the zoning established through the zoning map. It then must receive preliminary plan subdivision approval; followed by sewer capacity allocation, and then sewer pipeline connection authorization; followed by record plat approval, and then building permit approval; and finally receipt of occupancy permit. (A public facility that requires sewer would also require the two sewerage steps of allocation and authorization.)

Although the two procedural time lines have been illustrated diagrammatically in a symmetrical fashion, they are in fact dissimilar in terms of real world elapsed time. In general, the gestation period of a public project from budget approval to occupancy permit, is longer than the gestation period of a private project, from zoning approval to occupancy permit. Putting actual time estimates on these gestation periods is hazardous, because there is so much fluctuation due to individual circumstances; but private projects could proceed under normal circumstances in less than three years whereas public projects probably require four years or more. Obviously the sewer capacity problems of recent years have skewed these relationships, but these are not considered normal circumstances.

The current administration of the APF Ordinance exacerbates this time difference slightly. By using outstanding record plats as the benchmark, the private sector side is being measured at a point that normally is about one to two years away from occupancy permit. By using initiation of construction as the benchmark, located anywhere within the six year timeframe of the CIP, the public sector side is being measured at a point anywhere from four to nine years away from occupancy permit, depending on whether the initiation of construction is shown for the first year of the CIP or the sixth.

CSP Revisions to Current Regulatory Techniques

It is clear that there is no simple hard and fast rule that can do justice to all the complexities in this equilibrium issue. Since some administrative rule is required, however, the CSP approach recommended herein is as follows: (1) to change the point of measurement on the private side from record plat to sewer allocation; and (2) on the public side, from initiation of construction being contained within the CIP, to at least 50 percent of total construction costs being contained within the CIP.

On the public sector side, this shift would reduce the time horizon somewhat; and would also provide a higher degree of dependability, insofar as the commitment of 50 percent construction funding is more likely to represent a solid commitment to the completion of the project, than merely targeting the initiation of construction.

On the private sector side, the counting of all projects that have received sewer allocation, will reduce the amount of "float" inherent in the use of record plats as the benchmark. Also, a project that has proceeded to sewer allocation represents a degree of investment, on the part of the owner, that is more likely to represent a full commitment to completion of the project.

Another advantage of using this sewer allocation point is that, under the Interim Sewer Service Policy, the sewer capacity allocation is subject to a recapture provision, if it is not used within one year from the date of its approval. Since the sewer allocation approval list of the Washington Suburban Sanitary Commission can be monitored by the Planning staff, any reduction through recapture can be taken into account by the Planning Board in making its APF decisions.

This procedure will still allow for a certain amount of "float," represented by the backlog of approved preliminary plans that have not yet received sewer allocation. We believe that this amount of "float" should still be permitted to exist, in recognition of the tolerance range aspect of the equilibrium issue.

Further to this issue, we note that the longer gestation period on the public sector side constitutes, in effect, a further enlargement of the "tolerance range," above

that implied by the "float." It is conceivable that public facility projects could be scheduled for up to 50 percent of construction funding in the latter years of the CIP, and yet still be bumped backwards in time through annual revisions to the CIP. To the extent that this happens, it would widen the time discrepancy between the completion dates of the public growth compared to the private growth. Stated another way, it would be the equivalent of adding to the "float," or widening the "tolerance range."

After considering these factors, we have concluded that the two points, recommended for use as benchmark reference points in the APF decision, are both prudent and reasonable under the circumstances. Each tends to shorten the gestation period, somewhat equally, on both the public and private side, so that the APF measurement is more closely related to real world conditions. At the same time, there is sufficient magnitude in the "tolerance range," as a consequence of the "float" plus the gestation period differential, to constitute a reasonable effort at accommodating the statistical uncertainty of the "equilibrium" issue.

We note, in passing, that once a private project has received APF approval, on the basis of a CIP-approved public project, this APF approval is not revokable if the CIP project is deferred. We feel that this too is a reasonable provision, one that is desirable to provide a necessary degree of reliability to the private sector side of the development process.

Implementation & Agency Roles

Staging in a Pluralistic Process

In Montgomery County, the County Charter assigns planning, zoning, and subdivision to the County Council, with various administration roles performed by the Planning Board, the Zoning Hearing Examiner, and the Board of Appeals. It also assigns capital improvement programming, public services programming, and fiscal programming to the County Executive, with approval and veto power vested in the Council. Provision is made for input by the Executive into the planning, zoning, and subdivision process, and for input by the Council, Planning Board, and others into the capital, services, and fiscal programming process.

Similarly, various procedures have been developed for coordinating the roles of other agencies serving the County, such as the Board of Education, and the Washington Suburban Sanitary Commission, as well as such other regional and state agencies as the Council of Governments, State Department of Transportation, etc. In summary, the governance of the County is a pluralistic process, but with a primary emphasis on the roles of the County Council and County Executive.

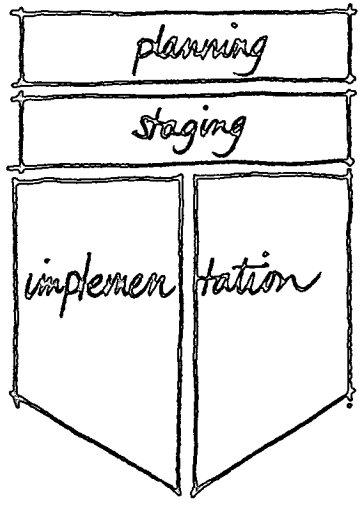
At the beginning of this chapter, we said that the old planning model of growth "accommodation" was predicated on the notion that government should perform two basic functions, namely, comprehensive land use "planning" and public facility "budgeting." In terms of this old growth accommodation model, the County's Charter assigns "planning" to the Council, and "budgeting" to the Executive. Under the new growth "management" model, however, we must also find a way to incorporate the concept of "staging."

With the advent of the ability to develop and maintain a CSP process such as outlined above, it is now possible to portray a growth management process that still follows the intent of the County Charter, and yet incorporates the new requirements of "staging." The best way to describe this is by referring to a revised version of the

growth management process model cited earlier in this report. The revised version has been adjusted to take into account the relationship between a periodically revised Comprehensive Staging Plan (CSP), and a periodically revised Capital Improvements Program (CIP). As used subsequently below, the term CIP includes implicitly the activities of Public Service Programming (PSP) and Fiscal Programming (FP), in a manner analogous to the use of the term "facility," earlier in this chapter, to also cover the provision of "services."

The Revised Management Process Model

Under this revised framework, the comprehensive planning element retains its components as before, namely, the General Plan, and its amendments in the form of Master Plans, Sector Plans, Functional Plans, and Ordinances. The private sector implementation stage begins, as before, with zoning; and carries through with the other procedural steps, as outlined in the preceding section. Similarly, the public sector implementation stage begins with budgeting; and also flows through the sequential steps outlined in the section above.



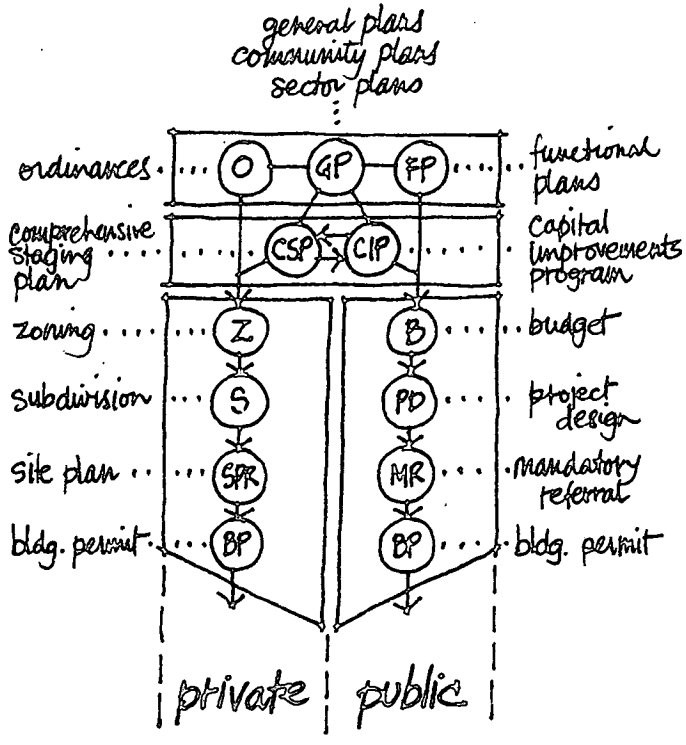
What is new is the concept that "Staging" constitutes an intermediate element between planning and implementation, one which is a separate exercise, yet one which is heavily influenced by the planning and implementation stages on either side of it. Conceptually, it remains a planning exercise, insofar as it is lacking the decisive action generating power, that characterizes the implementation phase. But, it is a planning activity that must be more heavily predicated than before, upon short-term timing and cost considerations, of the nature of those that enter into implementation decisions. For these reasons, it is characterized in the revised process model as a bridging element between the other two.

Traditionally, the short-term contingencies of timing and cost have been considered to be more closely allied to the nature of the Executive function than to that of the Legislative function. Conversely, the long-term considerations of spatial patterns and structural procedures have been considered to be more closely related to the functions of the Legislative Branch than to those of the Executive Branch. In particular, the designation of how the police power should be used, as in land use regulations such as zoning for example, has been considered a legislative prerogative.

Under the old approach of growth accommodation, these two divergent emphasis could maintain their momentum without generating too many operational problems of role definition. Under the new demands of the growth management approach, however, the Legislative Branch is increasingly required to take greater account of the contingencies of timing and cost factors, in order to determine how and whether private sector growth should be constrained through regulations. The result is a need to define a better marriage between the roles of the two branches of government in order to fulfill this responsibility.

The CSP/CIP Complementary Couplet

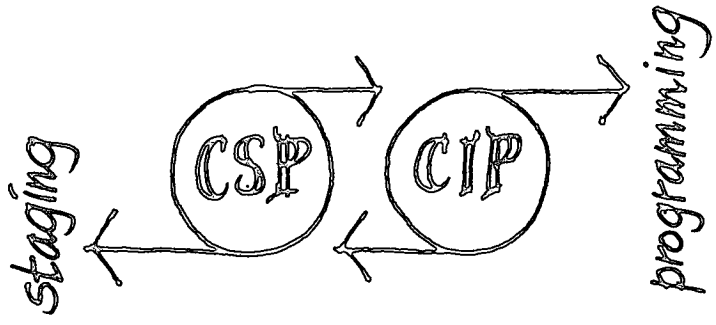
The role definition proposed in this report is illustrated diagrammatically by the incorporation of both the CSP and the CIP within the newly identified staging element of the growth management process model. Under this approach, the staging arena is viewed, not as a field to be fought over between the Executive and Legislative Branches, in a winner-take-all, zero sum game confrontation; rather it is viewed as a terrain that can only be successfully settled by a symbiotic partnership between the two branches, in which the aspiration is to reach the point where everyone wins and nobody loses. The motivating idea becomes one of "mutuality," rather than one of "exclusivity."



Thus, the CSP and the CIP are thought of as mutually influencing decision points that sequentially exchange places in the limelight of the interactive decision-making process between the Council and the Executive. Neither one is complete within itself. Only both together complete the concept embraced by the term "growth management." Like the notion of the dynamic couple in physics, or the reciprocating engine in mechanics, this view of the combined and complementary interaction of the CSP and CIP offers a way to harness the various forces of government to the productive task of growth management.

It is for this reason that we said earlier that the only part of the CSP to be officially adopted should be the thresholds on private sector growth. The CIP is the place in which to adopt officially the thresholds of public sector growth. In this way, the CSP and the CIP become a complementary couplet, that not only guide individually the private sector implementation process and the public sector implementation process, but also influence each other in a recurrent and mutually beneficial manner.

The CSP gives hard direction to the private sector implementation process, but only soft direction to the public sector implementation process; and it channels this soft direction through the CIP. The CIP, in turn, gives hard direction to the public implementation process, but only soft direction to the private implementation process; and it channels this soft direction through the CSP. Like partners in a marriage, who each have their province of emphasis, yet who both must agree in order for constructive teamwork action to occur, the CSP and the CIP together become the parents of the living entity we call Montgomery County. By acting together, they hopefully can nurture its development into a healthy and well-balanced adult community.

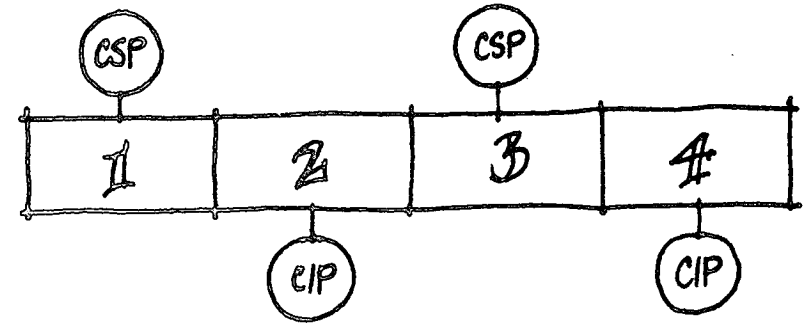


Action Proposals

To begin this marriage requires initially only the acceptance of the concept, and the adoption of the first CSP. It would be logical to follow this with a conversion of the periodic cycle of the CIP from an annual to a bi-annual adoption, with provisions for intermediate amendments on an annual, or lesser time frequency, basis. Thus, a completely interwoven process would see the CSP being adopted the first year of a newly elected government's term of office, followed by the CIP adoption the next year, with another CSP adoption the third year, and a CIP adoption the fourth year.

We may characterize the CSP as a broader and fuzzier document than the CIP, in the sense that it must grapple with a longer time horizon and a wider range of value judgments, associated with broad notions such as the "quality of life." Conversely, we may characterize the CIP as a more sharp and focused document, in the sense that it must deal with the detailed operational characteristics of specific individual projects. In short, it is possible to characterize the difference between the CSP and the CIP as being a difference in emphasis, between breadth of scope and depth of concentration.

Within this characterization, the bi-annual, interlocking adoption process outlined above seems logically related to the time scale of the four year election cycle. During its first year in office, an incoming government probably will wish to scan its horizons, and deal with broad perspectives, before proceeding to follow this up with a focused application to the specific implementation and fiscal details. Having thus been through one round of the full growth management cycle by mid-term, the elected officials should then be in a position to revise the broad perspective with course corrections as appropriate; and subsequently fine tune the precision focus once again, before completing their term of office.



The County Charter currently requires the CIP to be adopted on an annual basis. It would not be necessary to amend the Charter, in order to shift, as suggested, to a bi-annual CIP adoption, in a rhythmic sequence with the CSP. Similarly, it is not necessary to limit amendments to the CSP to a bi-annual basis. All that is required, in order to set the process in motion, is to establish administratively, by agreement between the Council and the Executive, that, in alternating years, the CIP should be done thoroughly, with a full review and adoption; and that, in the intervening years, only such amendments be considered as cannot wait until the succeeding year.

Some Advantages of the Revised Process

Such a process should prove to be a significant time-saver for the Council and Executive, since it would eliminate, in the alternate years between CIP adoptions, the need for time-consuming public hearings and worksessions, during the already very difficult period of budget consideration between January and May. The CSP would not impact the budget season in any year, since it can be dealt with during the fall.

In the past, the time necessary for the Council to review and adopt the Ten Year Water Supply and Sewerage Service Plan (WSP) also has been a problem, especially during budget season. By incorporating the sewer service area maps, required under the WSP state law, into the CSP, where they relate logically to decision-making about growth thresholds, and by providing for Council decisions about these maps to flow from the CSP adoption directly into Chapter One of the WSP, it becomes possible for the Council to deal with this element of the WSP in the fall of the year also. By doing this, it should be able to accommodate the remaining elements of the Ten Year Water and Sewerage Plan, primarily focussed on questions of cost, timing, and feasibility, along with the rest of the CIP during the budget cycle every second year.

It is well known that the County, for some time now, has been placed in an extraordinary situation, with regard to the need for major regional treatment plants, and that this problem has not yet been resolved, through any kind of intergovernmental understanding at the regional, state, and federal levels. The result has been that the County has resorted to extraordinary responses, in the form of the Interim Sewer Service Policy (ISSP) for sewer capacity allocation, and various other special studies and projects. These special activities have been dealt with on an as-need basis so far, without any systematization into a regular, periodic cycle.

We assume that, with the exception of the ISSP, which has now been put on a six month review basis, this ad hoc time sequence, for decisions about sewer capacity relief, will continue, until some longer lasting supply has been agreed upon. Consequently, these major sewer capacity problems have been treated, in this report, as a special short-term situation, outside of the long term, structural staging aspects of a general growth management system.

Outside of this major supply problem, the time burdens of the WSP with respect to cost and feasibility questions should not be relatively any heavier than that of the rest of the CIP. Now that the County has had a number of years experience, in tooling up and making decisions about the rest of this CIP, the monitoring and amendment of it should not be quite so time consuming as it has been in the past.

One of the side benefits of the shift to a bi-annual adoption would be a reduction in printing costs. At the present time, it is necessary to print the CIP documents twice a year, once to lay out the proposals for public review and Council approval, and once to record the final results of the Council's decisions. Not only would the costs be reduced under a bi-annual system, but also the life of the documents would be longer. At the present time, the final documents are hardly available before the next annual revisions is printed.

For all these reasons, the concept of shifting to an alternating bi-annual emphasis on the CSP and CIP seems not only well-fitted to the growth management process suggested herein, but also well in accord with the current public concern for efficiency in terms of governmental operations and expenditures.

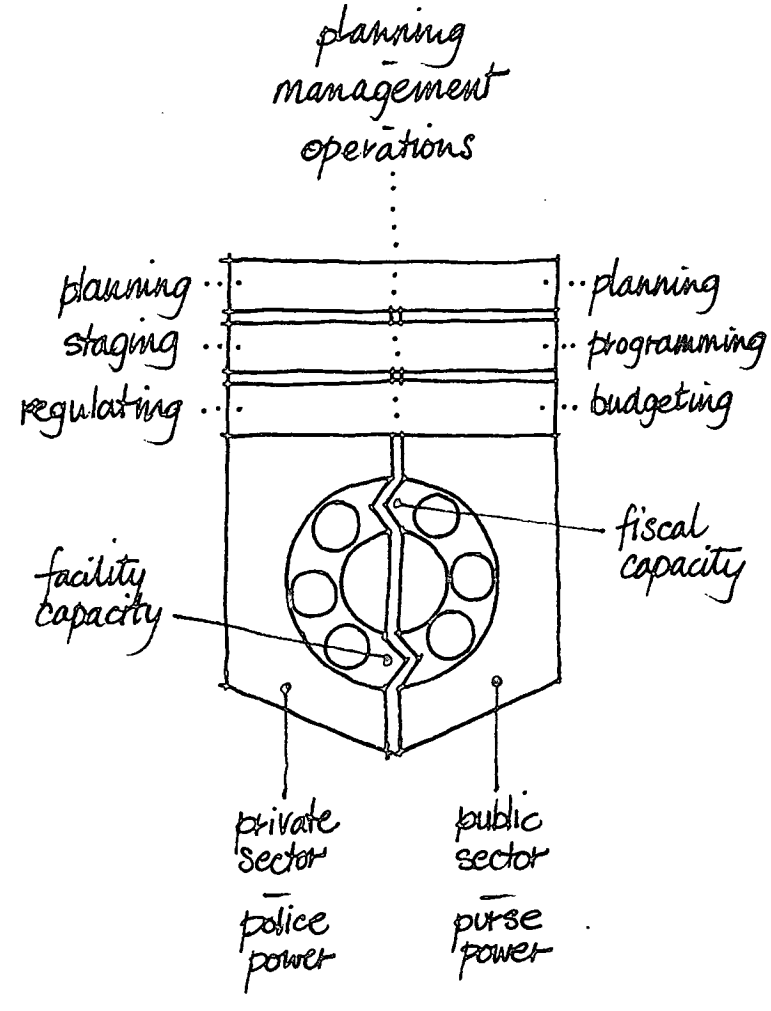
Summing Up With Symbols

Growth Management

One of the best ways to portray all these ideas succinctly is with graphic symbols. The symbolic shield on the front cover of this report represents the basic framework of the Montgomery Growth Management Model.

The six elements of the split circle of the urban growth model are contained and bounded by the three rectangles of the management process model. The three private sector elements (People, Jobs, & Housing) collectively impact the service "carrying capacity" of the three public sector elements. This impact is measured through an "adequate facility capacity" technique. In return, the three public sector elements (Community, Transportation, & Nature) collectively impact the financial "carrying capacity" of the three private sector elements. This impact is measured through an "adequate fiscal capacity" technique.

The real world products, that emerge from the play out of these crossover forces, are shaped by the events of two separate fields of action: (1) that of the public sector implementation process; and (2) that of the private sector implementation process. Success in growth management hinges on whether it is possible to maintain sufficient coordination and alignment among the events in these two arenas. Unless the twin horses of the purse power and the police power can be harnessed to run parallel, the chariot of the growth management idea cannot be steered to the goal.



This necessary harness is portrayed in the symbol by three horizontal bars. They represent the three hierarchical functions of government that need to be woven more closely together, across the public-private sector divide, if the growth management goal is to be reached. They can be named in three different ways:

(1) Planning, Programming, and Budgeting (PPB)
(2) Planning, Staging, and Regulating (PSR)
(3) Planning, Management, and Operations (PMO)

The first name set, PPB, really fits only the public sector side of the management model. This is reasonable, since it was derived from an effort, by the federal executive branch, to respond more efficiently to the "supply" imperatives of the national security mandate.

The second name set, PSR, really fits only the private sector side of the management model. This also is reasonable, since it was coined, in this report, as an effort, for a local legislative branch, to respond more efficiently to the "constraint" imperatives of the growth management mandate.

The third name set, however, is the one that crosses the chasm between the public and the private sector perspectives. Planning, Management, and Operations (PMO) are generic terms that implicitly contain both the PPB and PSR expressions.

Planning is already used by both. Programming and Staging are both variations of priority setting and scheduling, which are the essential tasks of Management. And Budgeting, and Regulating are both concerned with a series of specific actions, carried out according to rules, which are the essential attributes of Operations. Thus, the three symbolic cross bars represent the hierarchical harness that we characterize as Planning, Managing, and Operations.

The Staging/Programming Couplet

Three equal cross bars are adequate to represent the idea of three kinds of governmental "harnessing" activities. But they do not fully express their hierarchical aspect. Hierarchically, Planning is the most "permanent" or "stable" of the three; and Operations is the most susceptible to "changes." In terms of a harness analogy, Planning is more like the shafts that structure the relative position of the horses; and Operations are more like the reins that actually direct the action. What this analogy suggests is that Management must play the role of the "traces" that connect the horses to the vehicle, or to be more exact, the "whiffletree".*

The point of the analogy is to support the notion that the Management connection, to function well, must have a degree of flexibility. The growth management situation, just like the harness situation, seems to require a bridging connector that takes the form of a sturdy, yet flexible, hinge, rather than a rigid clasp.

The Staging/Programming Couplet proposed herein is just such a sturdy, yet flexible, connector. The sturdiness comes from the continuity of the periodic review process; and the flexibility comes from the alternating bi-annual focus. The former firmly hooks the police and purse power horses to the growth management vehicle; and the latter frees them to respond to the separate imperatives that condition their performances.

Symbolically, the couplet idea carries forward the analogy of the "whiffletree," or the sturdy "hinge." However, it adds to them the notion of periodic, contrapuntal rhythm, and cyclical rotation over time.

* Whiffletree: the pivotted swinging bar to which the traces of a harness are fastened, and by which a vehicle is drawn.

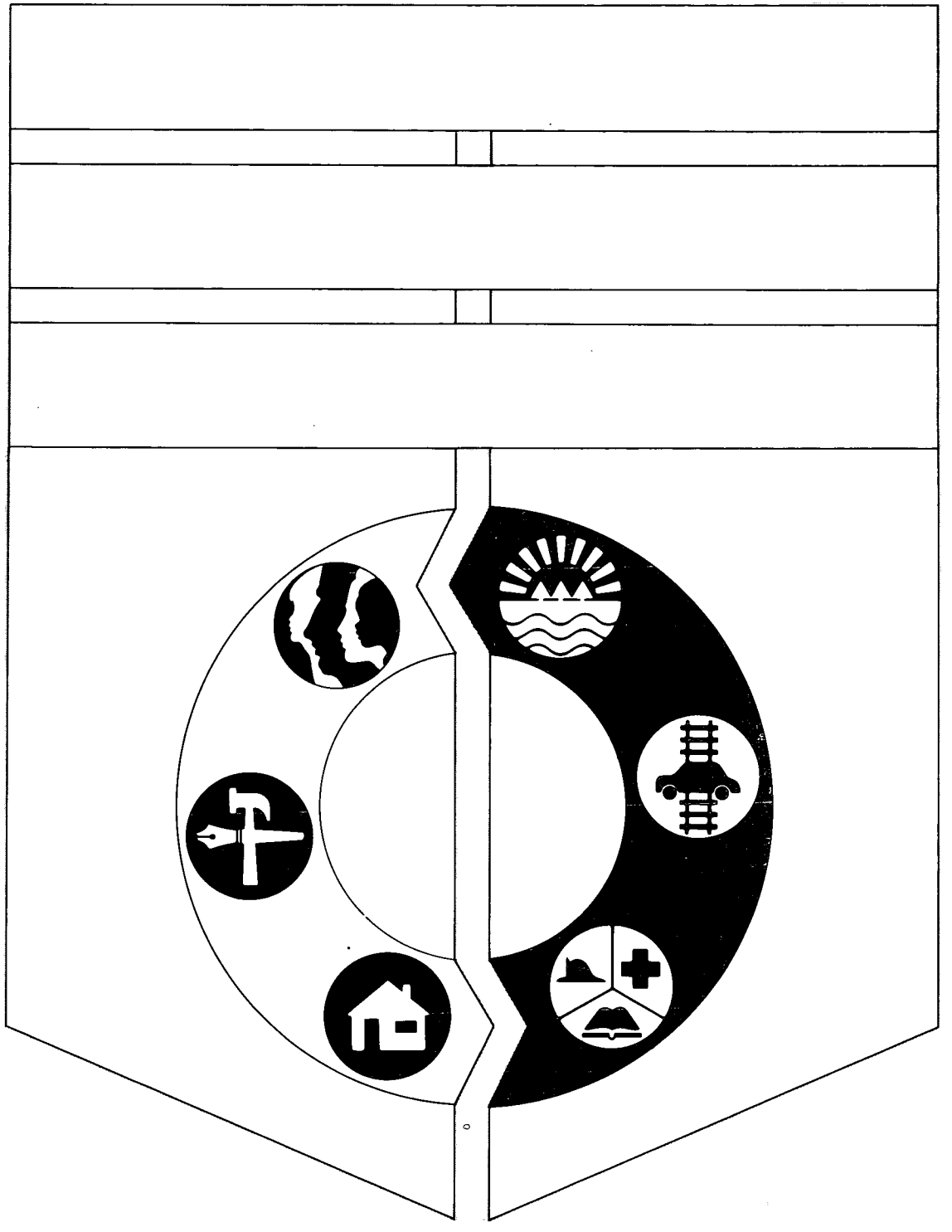
To capture these aspects spatially, we really need a circular element.

We chose to solve this little puzzle with the symbol portrayed on the back cover of this report. Centuries old, it seems to capture much of the essence of the growth management aspiration generally, and certainly the concept of the Staging/Programming Couplet specifically:

not One . . .

not Two . . .

but Both.



Chapter Two

Facilities

2 FACILITIES

INTRODUCTION

Step three of the carrying capacity rationale proposed that the effect of overstressing one urban system should be related to the aggregate health of the total urban organism, through some reasonable judgmental process. In deciding which models should be built for this growth management process, the planning staff evaluated the subsystems of the three community sector elements, on the basis of an informed technical judgment about their relative weights and inter-relationships. The results of this evaluation, in effect, constitute a schematic sketch model of the relative sensitivity to stress of these various systems in the context of Montgomery County's particular geography and conditions.

To begin with, it was noted that the major subsystems of the transportation and nature elements could be characterized as "networks" or branching tree systems, with physically interlinked segments; whereas the component sub-elements of the community element could be classified as "point" facilities, with respect to their geographic spatial attributes. Thus, roads, transit lines, water lines, sewer lines, streams and stream valley parks all form interconnected networks, whereas schools, clinics, police and fire stations all occupy individual plots of ground that are scattered throughout the general urban fabric.

This is not to say that point facility systems cannot or should not be modeled. It simply means that they cannot be defined in concrete physical terms. It means, in effect, that their systems aspect is to be found, not in the "facility" side of the manifestation, but rather on the "service" side of the manifestation (i.e., in statistical measures of service such as number of pupils per

classroom, or units of learning objectives achieved, etc.).

Two of the subsystems of the Nature element, namely earth and air, constitute a special case somewhat between that of the "point" facilities, and the "network" facilities. Like the network facilities, they share in a physical dimension, in that pollutant trace elements do have physical properties; but, like the "point" facilities, they must be modeled through techniques that do not rely on specific physical channels, techniques which allow for the fact that these pollutants are transported in rather diffuse ways, without very clearly definable network paths.

Within this kind of systems framework, which included a conscious evaluation of the relative role of the environmental subsystems, as well as an evaluation of specific conclusions drawn from previous planning studies, the conclusion was reached that, for Montgomery County, at the present time, the most sensitive subsystems were: (1) the sewerage system; (2) the highway system; (3) the fiscal system; (4) the school system; and (5) the stream valley park system, in roughly that order of priority. This is not to say that the other subsystems were considered irrelevant, but rather that these five systems were judged to be the ones to which the growth management approach of carrying capacity and stress threshold analysis most logically applied.

(1) Sewerage System

Sewage treatment capacity, with related pipeline distribution concerns, has a been a major problem for the County for a number of years. Under the present conditions of a stalemate among the various regional stakeholders (the federal government, the two states of Maryland and Virginia, the District of Columbia and the other local jurisdictions), there exists a treatment capacity problem that could have serious impacts on the private sector, unless it is resolved in the relatively near future. If it is not resolved, this will become the most critically stressed system in our urban fabric; and will become the single functional threshold governing all future growth.

(2) Transportation System

If, however, the major treatment capacity problem is resolved, the next most sensitive system will be the highway system. Many previously approved road proposals have been removed in recent years, as a consequence of environmental concerns and local resident opposition; and the funding and construction pace of the state highway program has lagged far behind the rate of growth in the County. Thus, a number of subareas of the County are beginning to approach unhealthy road congestion levels, and to warrant an examination that can relate their situation to the overall needs of the County in some comprehensive way.

In addition, the Planning Board has already invested heavily in the development of transportation analysis techniques; and has been upheld by the Maryland Court of Appeals in the application of these techniques in certain subareas of the County, through the adoption of local sector master plan amendments.

(3) Fiscal System

The fiscal system obviously is a matter of serious concern to the public, not only in Montgomery County, but nationally. Therefore it has been given considerable attention in the background work leading to this report. However, a fiscal analysis of the intermediate growth forecast indicated that the present level of public service probably could be maintained for this growth rate, if the assumptions about the character of the

private growth were to come true (see Chapter 4). Consequently, the staging plan developed herein did not use limits derived from the fiscal system. But these can be added in later if so desired, and/or if fiscal conditions change significantly.

(4) School System

Schools have a major fiscal impact on the County's budget, far out of proportion to the spatial influence that they exert over growth patterns. With the opportunity for busing students from one facility to another, the spatial determinism of the school system as a shaper of growth is more fluid than is the case for either sewerage or highway networks. Because of this fact, and due to the limitations of time, schools have not been analyzed in depth in this report; but they could be so analyzed at a subsequent date. If school threshold problems were discovered, that would undercut the growth capacity thresholds allowed by the sewerage and transportation systems, these conclusions could be amended into the staging plan.

(5) Stream Valley Parks

Finally, the stream valley park system is one that is important from a variety of environmental protection aspects, including stream water quality, storm runoff, sediment erosion, wildlife protection, and passive recreation. However, it has, to a large extent, already been planned for, in terms of having park acquisition areas laid out in adopted master plans. In terms of the staging of growth, it would seem that the most significant aspect here is a fiscal one, having to do with the ability of the County to maintain a pace of land acquisition and development, sufficiently in advance of the spread of speculative high land values, to avoid the risk of ultimately losing the opportunity to preserve these multi-purpose environmental protection areas.

In the light of this analysis, the first comprehensive staging plan presented in this report has been structured on a framework derived from the sewerage system and the transportation system, with the opportunity to come back at subsequent times and amend in other threshold considerations if warranted.

The Sewerage System Model

Last year's growth policy report proposed the development of a model capable of simulating the sewerage system in the County. Such a model, called the Sewer Evaluation System Model (SES), has now been completed. This model is described below, together with the conclusions derived from its application to the County's current and future situations.

As illustrated, this model essentially divides the County into a number of "sewer sheds"; and mathematically assigns various alternate future sewage flows, generated from the sewer sheds, into the trunk transmission lines shown. By aggregating these flows as they proceed down the gravity flow network, the model can predict where overflow pipe conditions are likely to occur in the future. It also has a fiscal component, in that it will produce the approximate cost range of resolving such bottlenecks through the construction of new pipe lengths.

The model has proven to be a useful planning tool for evaluating the relative stress levels, and their locations, that will be produced by alternative future land use patterns. To the extent that nearly all the County sewage flow finds it way to one treatment plant at Blue Plains, the model is not needed to identify the size of scattered sewage treatment plants, but it could be used for this purpose if so desired. It has proved helpful in pointing the way to some action recommendations, as outlined below, but it also constitutes an essential building block in the technical measurement structure

necessary to implement the comprehensive staging plan approach outlined above.

The term "sewer shed" was derived from the parent term "water shed." A water shed may be thought of as an area of land contained within a closed boundary perimeter, (i.e., a ridge line), such that the "stuff" of the system being analyzed within the area must all flow downhill, until it finds it way out through one funnel point at the bottom. In a sewer shed the "stuff" of the system is not natural ground and rain water, running in open stream channels, but rather waste water, running in enclosed pipe channels. Because most of the sewerage system of the County is a gravity flow system, the sewer shed shares the bounded container characteristics of the water shed, although we have had to make allowance for pumpovers from one sewer shed to another where they, in fact, occur.

The sewer sheds, defined in geographic area through the development of this model, constitute a data container that is organically fitted to the geographical pattern of the sewer network, which in turn derives basically from the topography of the County. Since sewage is generated by the combination of population, housing and jobs that exist within each sewer shed, the sewer shed areas become convenient geographic cells, or containers, within which to allocate alternative future land use growth patterns, expressed in terms of the forecast model elements, population, housing and jobs.

If stress on the sewerage system were to be the most limiting factor for growth management under all circumstances, we probably could stop at this point. However, it has been our thesis that transportation could become a more limiting factor than sewerage. Therefore, we have proceeded to develop a transportation modelling system that can be linked to this sewerage modelling system.

The Transportation System Model

In developing our transportation simulation model, we made use of an area analogous to a sewer shed, which we call a "traffic shed." In extending the concept from water shed to sewer shed to traffic shed, it was necessary to take account of the fact that traffic is not constrained by a gravity flow restriction. Roads form networks that do not all branch together down towards some common trunk at the bottom, but rather partake of the nature of an interlinked grid, that extends itself in a potentially infinite way across the landscape.

Initially, therefore, it might be supposed that it would be impossible to define a network system of roads and related traffic sheds, analogous to that developed for the sewerage system. However, the saving grace for the technical methodology lies in the fact that the Washington Metropolitan Area, and in particular Montgomery County, has an established pattern of major arterial roadways, densities, and traffic movements, that predominantly radiate from the center at the District of Columbia. In the abstract, the pattern is analogous to a wheel, with spokes extending out from a large intermediate hub in the form of the circular beltway, and extending also inwards to the interior of this hub, but branching together as they reach towards the center where they merge into a finer grain, combination grid and radial system.

It is a characteristic of a uniform grid street pattern to allow traffic to flow virtually uniformly in all four directions. In such a pattern, it is inherently very difficult to identify any "ridge lines" that would separate one traffic area from another. However, in Montgomery County, both inside and outside the Beltway, and in particular outside the Beltway, there is virtually no grid street system. The County's road pattern was developed largely in accordance with the national model planning text books of the 1950's, which

laid out subdivision patterns of winding, looping roads and cul-de-sacs. These were laid onto a skeleton pattern of old radial country roads, draining the countryside towards the city at the center.

For these historic reasons, traffic movement in the County is essentially forced to travel on a relatively wide spaced arterial road network that is predominantly radial out of the District of Columbia. The "directionality" of these radial corridors has been further strengthened through the adoption of the County's general plan, ("Wedges and Corridors"), and by the location of the two transit lines now under construction. The result of this historical circumstance is that it is not too difficult to delineate a set of "traffic sheds" which bear a logical relationship to the major arterial network.

A traffic shed may be thought of as a kind of a jelly fish, with an internal skeleton structure of major roads, and a skin, or boundary perimeter, that is permeable to a degree, but nevertheless constitutes a sufficiently definitive boundary system to be useful in relating the "stuff" inside the boundary to the skeleton system. By contrast, a water shed would be a shellfish with a hard impermeable boundary, and only one opening at the bottom.

In other words, a traffic shed can be used to define a quantitative relationship between the directional road segment that constitutes its spine and the traffic that will be loaded onto that road from the jobs, housing and population resident within its boundaries. To perform this calculation requires making an explicit allowance for a degree of "permeable" cross directional traffic flow, but this can be accounted for in a reasonable way, that is within the normal confidence intervals associated with this kind of mathematical modelling.

The planning staff, therefore, has developed an applied methodology, based on this concept, which results in the division of the County into traffic sheds as illustrated. By using some refined traffic modelling techniques, which include an allowance for modal split between highway traffic and transit traffic, it is possible to simulate the level of congestion on the road network, as a function of alternate growth patterns, in a manner analogous to that used in the sewerage model.

By the creation of a geographic conversion technique, which is one of the items referred to in the above mentioned land use data bank, it is now possible to take a forecast, expressed in terms of a distribution of jobs, housing and population, and convert it to both the sewerage model and the transportation model. This element of the land use data bank is the "rosetta stone" which allows us to develop a comprehensive staging plan, that can transfer the results of a growth stress simulation in the sewerage system into its effect on the transportation system, and visa versa.

The sewer shed and the traffic shed are the "work horse" data container levels, at which the mathematical calculations of this conversion process are conducted. However, the transportation analysis also led to the development of a larger unit of land, necessary to convert the stress thresholds of the road system into growth thresholds for subareas of the County. These areas are called Policy Areas. They were derived, essentially, from analyzing the transit service pattern of the County, both rail and bus; and by using this as a criterion related to the appropriate levels of congestion to be tolerated on the road network. This methodology is outlined in detail in part two of this chapter, but it results in a tiered pattern, as shown on the map, with the policy areas divided into four categories, according to the relative amount of transit service they enjoy.

The level of transit service increases, from virtually none in level one, to a high concentration of rapid rail

and various express and local bus services, in area four. Because it is the total transportation system that must be analyzed, it is argued that a higher level of road congestion is tolerable in those areas where there is a highly accessible alternative mode of transport (i.e., transit), than for those areas where the automobile is the only reasonable mode available.

The result of this analysis is the establishment of a level of service criterion for the road system that differs by degree as you progress from level one to level four. Through the traffic modelling process, it is possible to establish growth thresholds levels in terms of total jobs, housing and population, for each of the policy areas, which are keyed to the level of service thresholds on the road network. It is growth thresholds for these policy areas that constitute the basic structural building blocks of the comprehensive staging plan, as will be described more fully below.

SEWERAGE SYSTEM ANALYSIS

Summary

This section assesses the impact of forecasted growth and proposed growth thresholds on the capacity of presently programmed sewer lines and treatment plants.

A sewer evaluation system (SES) partly funded by COG was utilized in this analysis. This model is an interacting model, which served as an excellent tool for evaluating complex planning issues related to sewers.

The model has been applied to the revised Cooperative Forecasts and the results essentially agree with the growth related projects included in the WSSC CIP.

The following recommendations are made as a result of this analysis:

- Immediate action to protect land from subdivision and apply for N.P.D.E.S. permit for the Rock Run Treatment Plant. This treatment plant should be built in stages compatable with future needs. However, the National Pollutant Discharge Elimination System (N.P.D.E.S) permit should be for the maximum potential need.

- Immediate action to analyze alternative solutions to the forthcoming transmission line constraint in Rock Creek and an early policy decision on how to best resolve this problem.

- Encouragement of the use of the SES model, as a planning tool, throughout the Washington Metropolitan region, especially within the Washington Suburban Sanitary District.

- Action to revise the present residential dwelling unit allocation factor to conform with actual observed flow (i.e. charge from 400 gpd to 300 gpd).

Background

The general sewerage situation in the County has been somewhat improved due to the development and implementation of the pragmatic Interim Sewer Service Policy. Also, the State has now lifted the sewer moratorium throughout the County, with some minor transmission constraints in localized areas. However, the need for treatment and transmission capacity for future growth and clean-up of existing systems still exists.

The fourth annual growth policy analysis recommended that a computerized model, having the capabilities to analyze the flow network, be developed to assist in the development and review of CIP projects, the development of sound land use decisions, the implementation of the adequate public facilities ordinance, and the evaluation of the bi-annual sewer service area category change requests.

To accomplish this, it was originally planned to use the SSCAN* computer program of the Washington Suburban Sanitary Commission (WSSC). However, after discussions with WSSC, it became apparent that this program would not be fully operational in time for this report. Subsequently, the Planning Board contracted with the Interstate Commission on the Potomac River Basin to develop, calibrate and verify the SES** model for Montgomery County.

Thus, this analysis is a further continuation of work done under the fourth annual growth policy report. The type of analysis performed is adequate for planning purposes. It is recognized that, for the actual design of sewers, treatment plants, and force mains, a more sophisticated model like SSCAN is desirable.

Sewer Evaluation System Model (SES)

The sewer evaluation simulation model was developed by the Metropolitan Washington Council of Governments as a part of its 208 Program, in cooperation with the Interstate Commission on the Potomac River Basin. This model is an interacting model which can serve as a useful tool for evaluating a complex sewer system for planning purposes. The main purposes of this model are:

1. To simplify the task of generating sewage flows, analyzing transmission, treatment and receiving water constraints.

2. To determine when and where transmission and treatment capacities would be needed.

3. To evaluate location and sizing of facilities and pattern of flow reduction.

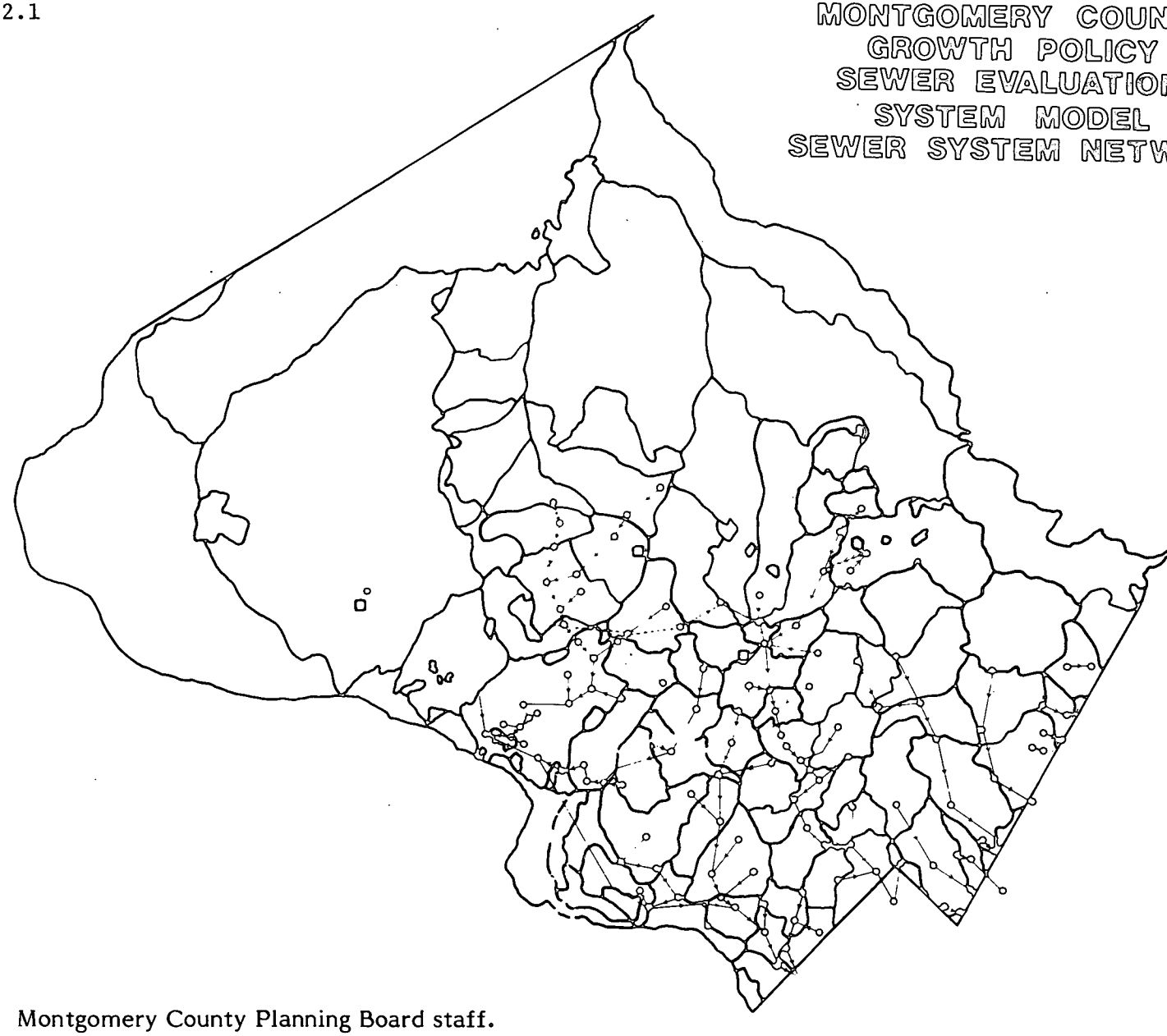
4. To provide a general idea of the total capital costs, operation and maintenance costs, and the present value, of all the costs that would be incurred during a design period.

The sewerage system is described in the simulation as a

* SSCAN - Sewerage System Capacities Analysis Network.

** SES - Sewer Evaluation Simulation Model.

Figure 2.1



Source: Montgomery County Planning Board staff.

network of nodes joined by arcs. A node represents a junction point in the system. These are placed at locations, where small feeder sewers flow into the system and at other appropriate points. The system works on the flow balance theory; what flows in must flow out. Arcs represent capacity portions of the system (sewers, treatment plants and force mains). Arcs are associated with capacities and operating and maintenance costs. The flow network is the basis of the simulation. The projections for each year are compared with the existing system capacities to determine when the system will run out of capacity and where in the system the critical inadequacies will be located.

After determining when and where the system will first exhaust its existing hydraulic capacity, the size and location must be chosen for the first expansion. When expansion is necessary, the simulation becomes interactive. It displays, on an interactive device, when and where in the system the capacity constraints are violated. The user inputs the action to be taken using the same interactive device. The simulation evaluates the cost of the actions and tests to see if they are sufficient to solve the capacity problems. If a constraint still exists, the user is requested to specify additional actions to be taken. Otherwise an efficient operating scheme will be determined in order to reduce operating cost. Having made a replacement or expansion decision, a new operating scheme must be found to evaluate the system for each time step until a new capacity constraint is found.

The model takes into account the following sequences:

1. Evaluating each step until a violation is found.
2. Expansion decision.
3. Operating scheme determination is repeated until the planning horizon is reached.

A typical SES printout is illustrated in Table 2.1.

Table 2.1

TYPICAL SES PRINT-OUT

```
MONTGOMERY COUNTY CALIBRATED DATA PIPES AT 92%, STP's OPERATING
1978
SKIP TO NEXT DATA DECK? (YES, NO, QUIT)

PROJECTIONS UPDATED TO
1978
NO OF ARCS=  268 NO OF NODES=  143

NO FEASIBLE FLOWS FOUND FOR 1978
THE FOLLOWING NODES CONTRIBUTE TO PROBLEM: (ARCS LISTED ARE
SITES OF OVE RFLOWS)
7A0301
     7A0301  7A0401  1.100
TOTAL CAPACITY OF OVERFLOWING ARCS =  1.10
THESE SEWERSHED ARCS ARE CONSTRAINED BY LOWER BOUNDS:
     SSRCE  7A0301  1.313
TOTAL FLOW FROM CONTRIBUTING SHED =  1.31

DO YOU WISH TO WRITE A FILE? (YES, NO, SYSTEM, QUIT)
SYSTEM WILL LIST ALL INFORMATION AT THE TERMINAL -

NO
IF YOU NEED STATISTICS TYPE "INFO", ELSE TYPE "NO"
NO
ENTER DESIRED ALTERATION:
BEGINNING NODE?
7A0301
ENDING NODE?
7A0401
FACILITY TYPE? (STP, LTF, SWR, FMN)

NEW CAPACITY ON ARC?

50
NEW FACILITY? (IF OLD, TYPE "ABD" OR "UPG"
NEW
LENGTH (THOUSANDS OF FEET)?

12
COMPUTED COST: CAP, FOM, VOM:  1.080  0.0  0.0
TO IMPLEMENT, TYPE "YES": TO INPUT DIFFERENT COSTS, TYPE "NO"
YES
```

Development of Data Base

(a.) Sewersheds

In order to use this model, the area served by the sewer systems in Montgomery County is divided into sewersheds. These sewersheds represent conglomerates of mini-basins, which were developed as part of an infiltration and inflow studies contracted previously by WSSC. A typical map showing these sewersheds is shown in Figure 2.1.

(b.) Flow Generation Factors

Initially, it was decided to use the methodology proposed in the mid-term facilities report. Actual flow data was collected from the Flow Monitoring Section of the Washington Suburban Sanitary Commission. Population estimates developed by the Planning staff were used in this model together with flow generation factors of 80 gallons per capita per day for domestic flow and 48 gallons per employee for commercial and industrial flow. For inflow and infiltration, actual measured inflow and infiltration for each watershed was used. After many runs of the model, it became apparent that the overall average flow generation factors for the County would result in significant disagreement between measured and simulated flow within the system at different locations. Consequently, it was decided to use water data for simulation purposes.

Data on water use was obtained from the Sanitary Commission. For each known point where sewage flow is monitored, the total water use is computed from the files provided by the Sanitary Commission. The difference between the sewer flow measured and the water used gives a measure of infiltration and inflow and losses for a given location within that system. Similarly, the water demand files provide the total domestic, commercial, industrial and institutional flow. These amounts are divided by total population and total employees to give gallons per capita per day for domestic flow and gallons per employee per day for the commercial, industrial and institutional flow.

Total infiltration, at each flow monitoring point is divided by population to generate gallons per capita for infiltration and inflow. These revised flow generation factors are used to calibrate the model. Using these revised flow generation factors, simulated flow is within $\pm$ 2 percent of the actual observed flow at every point. This is less than the error induced in measurements.

For the purpose of estimating infiltration and inflow for the forecast years 1985-1995, and ultimate planned population capacity an average value of 600 gallons per inch diameter of pipe is used. This is consistent with the methodology used in the report, a Mid-term study of Sewerage Treatment facility and Sewerage needs.

These revised flow generation factors provide a better estimate for simulating various sewersheds in the sewer system.

(c.) Peak Capacity

Data on peak capacity is obtained from WSSC files and the current Ten-Year Water and Sewerage Plan.

In the development of a data base, total peak capacity of the pipes is reduced by 8 percent to reflect Montgomery County's criteria of requiring appropriate correction to a sewer pipe whenever the flow reaches 92 percent of hydraulic capacity. Also, adjustments are made to the peak capacity to take into account areaway flows. Data on areaway flows are provided by WSSC.

(d.) Peaking Factor

The ratio of average to peak, as given in the current Ten-Year Water and Sewerage Plan is used.

(e.) Pipe Capacity

The pipe capacity for a given arc reflects the minimum capacity within that arc. It is possible that the minimum capacity as used in the model may reflect only a very small pipeline and there may be other segments which may have a much higher capacity depending upon the slope and the size. However, the approach adopted is a conservative one for planning purposes.

(f.) Cost

Estimates of the cost for sewers are based on WSSC unit costs for sewer for various diameter pipes ranging from 10 inches to 60 inches assuming 0.50 percent slope. For a different slope the necessary adjustment could be made or a different cost could be input into the program. WSSC cost data was used.

The cost of treatment plants in the costing routine is obtained from the graphs and charts from the data provided in the mid-term facilities report, previously noted.

(g.) Physical Constraints

The model does not take into account any physical constraint or blockage of sewage flow from one manhole to another manhole.

Conclusions

An analysis of several runs of the SES model, leads to the following conclusions:

Flow Generation Conclusions

From a statistical point of view it appears that the use of constant flow generation factors throughout the County would not calibrate the model at locations where sewage flow data was available. It appears that, for some reason, flow generation factors for the Western County are slightly higher. It may be pointed out that the Bi-County Water Supply Task Force also indicated that flow usage of water is dependent on location (zip code) and income level.

Flow Monitoring Conclusion

At present, under ISSP, sewage capacity is being distributed at the rate of 400 gallons per day per dwelling unit.

This does not agree with the County-wide average for gallons per capita per day usage. Intermediate average household size in Montgomery County is forecast to decline from it the current estimate of 2.93 persons to 2.68 by 1995. Thus a more appropriate per dwelling unit allocation seems to be in the range of 300 gallons per dwelling unit. This amount would allow for infiltration and inflow.

Transmission Line Conclusions

(1) Results from model runs compare favorably with WSSC's CIP Projects. The SES run for high and intermediate forecasts for 1995 reinforces the

Table 2.2

EVALUATION OF PROPOSED CIP SEWER PROJECTS FY's 1980-1985
(Round 2 Cooperative Forecast)

PROJECT IDENTIFICATION					PROJECT EVALUATION THROUGH SES			COMMENT
PDF Number	WSSC Project Number	Basin	Project Description	SES Nodes	Project Needed 1995 Interm.	Project Needed 1995 High	Project Needed Ultimate 2025	
5034	S-91.02	Anacostia	NW Branch Relief Sewer	7A1801 7A1701 7A1401 7A1301 7A0901 7A0701 7A0501	No	No	No	SES Model run indicates adequate capacity in the system through the year 2025. Need further evaluation in conjunction with Eastern Regional Plan.
5043	S-33.03	Anacostia	Paint Branch Relief Sewer	7A1501 7A1001 7A0801	Yes	Yes	Yes	SES Model run indicates capacity problems by 1985 in the lower reaches of Paint Branch from node 7A0801 into Prince George's County. Additionally in 2025 capacity problems, beginning from nodes 7K0701 (Patuxent), through 8A9999 Prince George's will occur.
5045	S-98.06	Anacostia	Sligo Creek Replacement Sewer	7A0601 7A0201	Yes	Yes	Yes	SES Model run indicates existing capacity problems in the lower Sligo Creek. Existing sewer is 50 years old and in questionable condition.
5051	S-102.03	Little Falls	Willet Branch Replacement Sewer	7G0601 7G0501	Yes	Yes	Yes	SES Model run indicates inadequate capacity throughout much of the system.
5052 5053	S-102.05 S-102.02	Little Falls	Little Falls Replacement Sewer	7G0301 7G0501	Yes	Yes	Yes	SES Model run indicates capacity problems from node 7G0301 to node 7G0501. Existing sewer line is 37 to 56 years old and at or near capacity.
5054	S-102.04	Little Falls	Little Falls Replacement Sewer	7G0201 7G0501 7G0601 7G0301	Yes	Yes	Yes	SES Model run indicates capacity problems in lower Little Falls Branch. Trunk lines replacement in this area is presently under construction.
5055	S-103.04	Cabin John	Cabin John, Branch "D" Replacement Sewer	7G1401 7G1301	Yes	Yes	Yes	SES Model run indicates capacity problems from node 7G1401 to node 7G1301.

Source: Montgomery County Planning Board staff.

Table 2.2 (Continued)

EVALUATION OF PROPOSED CIP SEWER PROJECTS FY's 1980-1985
(Round 2 Cooperative Forecast)

PROJECT IDENTIFICATION					PROJECT EVALUATION THROUGH SES			COMMENT
PDF Number	WSSC Project Number	Basin	Project Description	SES Nodes	Project Needed 1995 Interm.	Project Needed 1995 High	Project Needed Ultimate 2025	
5056 5057 5058	S-103.07 S-103.08 S-103.05	Cabin John	Cabin John Relief Sewer	7G0401 7G0405 7G1001 7G1301 7G1701 7E0101	Yes	Yes	Yes	SES Model run indicates capacity problems throughout most of Cabin John.
5061	S-49.03	Rock Creek	Rock Creek Relief/Storage Sewer		Yes	Yes	Yes	SES Model run indicates capacity problems in the lower Rock Creek beginning from the county line and continuing upstream. Project 49.03, primarily acts as a holding tank, is not recommed. We support a comprehensive transmission system.
5064	S-49.06	Rock Creek	Rock Creek, Branch "B" Replacement Sewer	7D0101 7D0301	Yes	Yes	Yes	SES Model run indicates capacity problems by 1985 from node 7D0301 to node 7D0101. Existing sewer line is 49 years old and experiencing maintenance problems.
5068	82.03	Seneca	Gunners Branch, Branch "M"	7H0801	No	No	Yes	SES Model run indicates adequate capacity through 1995. Model does indicate capacity problems throughout bulk of Seneca and Muddy Branch Basins for ultimate.
5070	84.08	Seneca	Little Seneca Force main and Gunners Branch relief sewer	7H0601	No	No	Yes	SES Model run indicates adequate capacity through 1995. Model does indicate capacity problems throughout bulk of Seneca and Muddy Branch Basins for ultimate.
5071	82.02	Seneca	Gunners Branch, Branch "L"	7H0602	No	No	Yes	
5072 5073	S-53.4 S-53.3	Seneca	Great Seneca Relief Sewer	7H0102 7H0301 7H0401 7H0501 7K1102 7H0701	No	No	Yes	SES Model run indicates adequate capacity through 1995. Model does indicate capacity problems throughout bulk of Seneca and Muddy Branch Basins for ultimate.

Source: Montgomery County Planning Board staff.

Table 2.3

TOTAL AND MARGINAL SEWERAGE NEEDS (MGD)
ROUND 2 COOPERATIVE FORECASTS*

	Total County	Eastern County	Central County	Western County
Intermediate**				
1978	73.00	19.49	23.36	30.15
1995	93.00	22.02	29.23	41.75
Increase	20.00	2.53	5.87	11.60
High**				
1978	73.00	19.49	23.36	30.15
1995	100.42	23.57	31.37	45.48
Increase	27.42	4.08	8.01	15.33
Ultimate Holding Capacity**				
1978	73.00	19.49	23.36	30.15
1995	131.82	25.32	43.71	62.79
Increase	58.82	5.83	20.35	32.64

* Rockville flow included.
** Flow data from SES model run.

Source: Montgomery County Planning Board staff.

need for current WSSC's CIP projects. Table 2.2 lists the results of the SES analysis.

(2) The most severe transmission problem appears in the Rock Creek Basin. Most of the lower Rock Creek sewer is insufficient to carry future growth in this critical basin. Transmission problems were also identified for Paint Branch, Sligo Creek, Muddy Branch, and Cabin John sewers.

(3) Since the peak flow from Rock Creek to D.C. is limited to 56.6 mgd, a critical policy decision has to be made either to pump the excess flows to lower Anacostia Basin (P.G. County) or to the Rock Run Basin.

(4) To accommodate future development in Olney, force main from James Creek Pumping Stations may need upgrading.

Treatment Capacity Conclusions

A firm commitment to additional treatment capacity is needed in the immediate future. In arriving at this conclusion, an analysis was made of the future sewage flows on the basis of population holding capacity determined by existing master plans, sector plans and General Plans, compared to future sewage treatment capacity. Table 2.3 gives the total and marginal needs of the County for ultimate population holding capacity. Tables 2.4 and 2.5 suggest that Montgomery County's long-term unmet needs are very small, ranging between 0 to 8 mgd. At first glance this would suggest that there is no treatment problem. However, these estimates do not take into account a number of major risks that would be run if the assumptions used in this analysis do not come true. On balance, these risks are too great to suggest that the numerical analysis be accepted at face value in making a policy decision about treatment capacity investment.

Table 2.4

MONTGOMERY COUNTY SEWERAGE NEEDS: 1995 INTERMEDIATE (ROUND 2)

	Average Annual Flow*	1995 Intermediate** Population	Employees	Domestic Flow mgd	Commercial & Industrial Flow mgd	Total Flow mgd	Total Flow 1995 mgd	Available Sewage Capacity mgd		Net Sewage Capacity Needed mgd
CITY OF ROCKVILLE	5.0	10,000***	32,000	0.80	1.536	2.360				
Average I & I						0.148				
						2.508	7.508		9.30	+ 1.792
DISTRICT OF COLUMBIA										
Future Growth Needs		42,000	60,000	4.62	1.50	6.12				
Montgomery County Share (1/3 Total Needs)						2.10				
MONTGOMERY COUNTY	68.00	143,000	102,500	10.86	4.92	15.78	83.78	Blue Plains	77.60	
Average I & I						2.23	86.01	Seneca	5.0	
Septic Relief						0.50	86.51	Rock Creek	3.0	
Assume too many jobs were allocated to Rockville (Shift of 16,000)			16,000			0.77	87.28	Montgomery Village	1.0	
Montgomery share of D.C. Needs						2.10	89.38	Other small	1.0	
									87.60	
Correctable I & I									2.00	
Montgomery County Needs							89.38		89.60	+0.22 mgd

* Includes average I & I.
** 95% of Population will be served.
*** Based on City of Rockville's estimate.

Source: Montgomery County Planning Board staff.

Table 2.5

MONTGOMERY COUNTY SEWERAGE NEEDS: 1995 HIGH (ROUND 2)

	Average Annual Flow*	1995 High** Population	Employees	Domestic Flow mgd	Commercial & Industrial Flow mgd	Total Flow mgd	Total Flow 1995 mgd	Available Sewage Capacity mgd		Net Sewage Capacity Needed mgd
CITY OF ROCKVILLE	5.0	10,000	32,000	0.80	1.536	2.360				
Average I & I						0.148				
						2.508	7.508		9.30	+ 1.792
DISTRICT OF COLUMBIA										
Future Growth Needs		56,000	79,000	6.16	1.975	8.135				
Montgomery County Share (1/3 Total Needs)						2.71				
								Blue Plains	77.60	
MONTGOMERY COUNTY	68.00	202,500	145,500	15.39	6.98	22.37	90.37	Seneca	5.0	
Average I & I						3.00	93.37	Rock Creek	3.0	
Septic Relief						0.50	93.87	Montgomery Village	1.0	
Assume too many jobs were allocated to Rockville (Shift of 16,000)			16,000			0.77	94.64	Other small	1.0	
									87.60	
Montgomery share of D.C. Needs						2.71	97.35			
Correctable I & I									2.00	
Montgomery County Needs							97.35		89.60	7.75 mgd

* Includes average I & I.
** 95% of Population will be served.

Source: Montgomery County Planning Board staff.

(1.) Risks Associated with the Forecasts

(a) Water consumption may go up. With increasing usage of water consuming appliances such as garbage disposals, washers etc., water usage per dwelling unit may go up. This possibly could be counter-balanced by conservation and pricing policies, but they cannot be relied upon to be effective.

(b) The assumption of declining population household size for the entire design period tested could very possibly not materialize. Although this forecast assumption seems reasonable in the light of fairly long-term trends, it is possible for major counter-forces, to shift this trend back to higher household sizes. This could increase total sewage generation from the same number of households considerably.

(c) Although it appears that the intermediate population forecast is the most probable, planning should take into account the risk of a sewage capacity shortfall if the higher forecast should materialize.

(2.) Risks Associated With Current Flows to Blue Plains

(a) There are questions subject to legal interpretation as to the exact amount of D.C. share in the Blue Plains plant. A capacity allocation higher than 135 mgd would mean lesser available capacity for Montgomery and Prince George's Counties.

(b) There are many questions related to the actual operation and rating of Blue Plains, especially recognizing the combined sewer and storm water system problem in the District.

(3.) Risks Associated With Current Interim Treatment Plants.

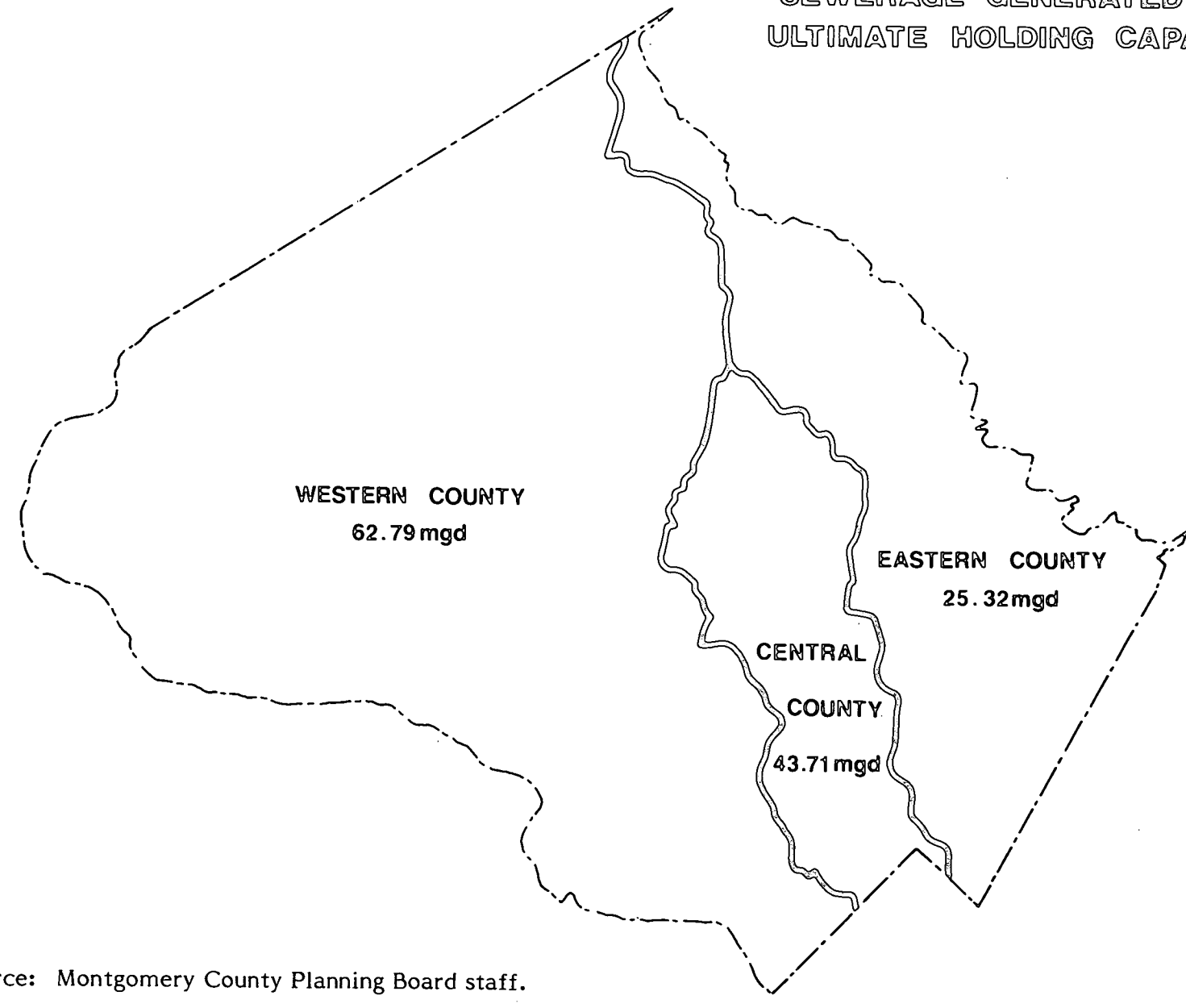
In the analysis it was assumed that all the present interim treatment plants would be granted extension, by the state and continued in operation indefinitely. However, there is no guarantee to that effect from the state. A denial of extension of N.P.D.E.S. permits for any of these plants would mean loss of current treatment capacity.

(4.) Risks Associated With Market

There is a need for extra sewage capacity for the marketdevelopment process to work without too much friction.

While it is difficult to measure precisely the total import of all these risk elements in absolute terms, it is clear judgmentally that the sum of these risks is sufficiently high that no time should be lost in beginning to plan and design for the previously selected Rock Run treatment plant.

SEWERAGE GENERATED FOR ULTIMATE HOLDING CAPACITY



Source: Montgomery County Planning Board staff.

Group IV policy areas lie within the I-495 Beltway, Bethesda and Silver Spring. Metrorail access will be the same as the Group III areas except that the bus networks will be denser and a higher percentage of existing and future development will be concentrated within walking distance around the Metrorail Stations.

The method of staging relies upon the total transportation level of service concept. It is applied in a consistent manner to each grouping of policy areas. Development will be allowed to occur as long as the combination of highway level of service and transit availability is sufficient to maintain an acceptable overall transportation level of service.

Highway conditions will be measured by the percentage of travel at level of service E or worse. The allowable percentage varies depending on the type and extent of transit that will be available. The timing of development expressed in terms of staging thresholds will coincide with the availability of both highway and transit improvements. These staging thresholds will be lifted when improvements to the critical link or links have 50 percent of construction funds programmed within the Maryland Department of Transportation's Consolidated Transportation Program or the Montgomery County Capital Improvements Program.

The development of a County-wide staging plan also provides the opportunity to give direction to the transportation capital programming responsibilities of the State and County. A 1995 time frame analysis was conducted with an assumed network of highway and transit improvements. Construction of the State projects proposed herein will require increases in transportation revenue sources, to provide future funding levels which are equivalent in purchasing power to today's funding level. In addition, high Statewide priority will be required for the major funding obligation of primary roads within Montgomery County.

The County six year capital programming process has a relatively short time horizon for considering future projects. Future potential County projects are identified which appear to be within the long term funding and administrative capabilities of the County to implement.

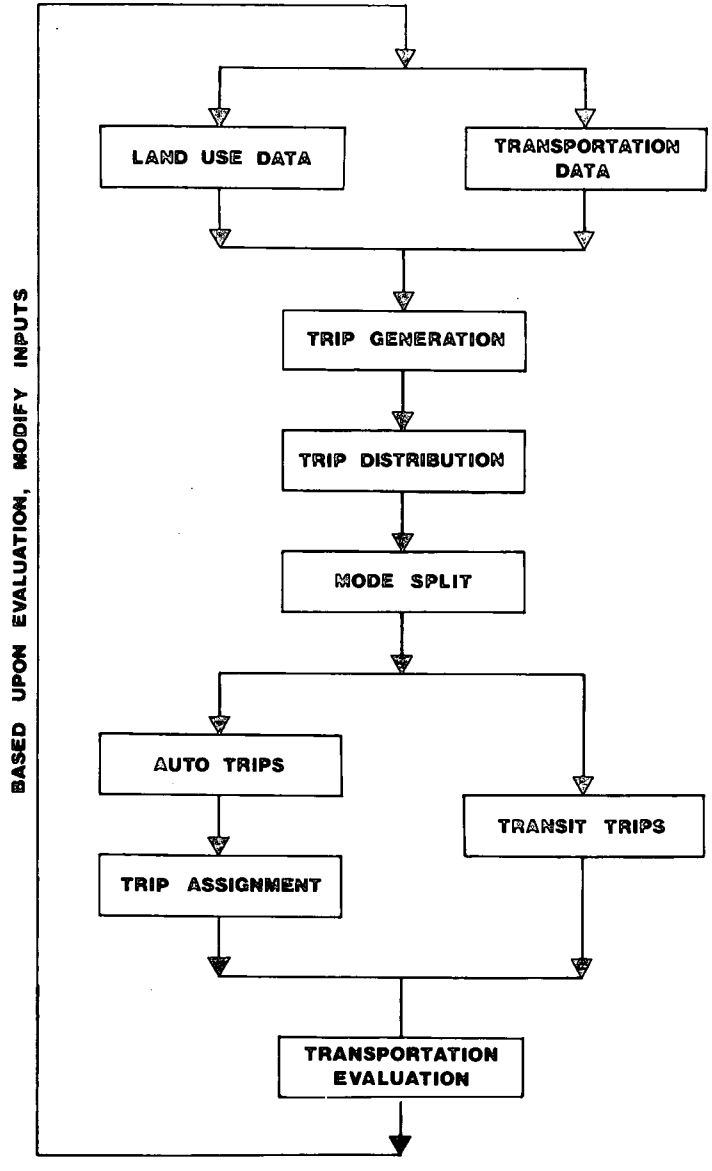
Total Transportation Service Concept

To better address the measurement of growth on the transportation system, a new conceptual approach, that of total transportation service, has been used. This concept is made up of two parts: projected levels of highway congestion; and the availability of transit service. The dual consideration of these two components results in the establishment of a relatively constant level of total transportation service throughout the County.

Chapter 1 has outlined some of the difficulties of measuring traffic impacts on a subdivision-by-subdivision basis, using the current standard level of service 'D' at the nearest major intersection. Traffic generated by an individual subdivision disperses rapidly and only nearby intersections can be analyzed with some certainty. Since most subdivisions are of relatively small size, the projected increases in traffic at even nearby intersections are small relative to the total traffic, also, the normal variation in traffic over the course of a year is greater than the expected changes in traffic due to individual subdivisions.

Impacts of growth on transportation facilities can be better measured on an aggregate scale, than on this subdivision-by-subdivision basis. In this way, interaction between areas, and the downstream impact of traffic can be analyzed, as well as the influence of transit usage taken into account. It is not sufficient to examine only the aggregate highway traffic impacts.

Figure 2.3
TRANSPORTATION MODEL OUTLINE



What is necessary is to consider the total level of transportation service available, including transit.

Highway Levels of Service

Considering highway traffic first, we note that a traffic modeling approach is required to measure projected highway levels of service under alternative possible future conditions. Figure 2.3 is a schematic of the basic elements of the transportation modeling system used in this analysis. This model considers land use and transportation relationships on a region-wide basis, with particular emphasis on Montgomery County.

Land use information consists of dwelling units, and four categories of employment; office, commercial, retail, and other. Future highway and transit networks are defined, with link information provided, such as highway classification, cross sectional width, and highway and transit travel speeds. Trip generation and distribution factors, including parking cost, access time, and household income categories, are also required. The model was developed under grants from the Federal Highway Administration and the Urban Mass Transportation Administration, and utilizes the TRIMS model developed by the Metropolitan Washington Council of Governments.

The model uses a four step process:

1) trip generation (the number of trips beginning or ending in a traffic zone)

2) trip distribution (the number of trips between pairs of zones)

3) mode split (the number of auto versus transit trips between pairs of zones)

4) trip assignment (the route taken by auto trips between pairs of zones)

The principal output of the transportation model is projected average daily traffic volumes (ADT) assigned to the highway network. These trips are produced by dwelling units and attracted by employment. Various alternative combinations of land use and transportation network assumptions will result in different traffic volume demands being imposed on the highway system.

Based on an evaluation of these demands, compared to highway capacity and transit availability, an alternative land use or transportation network, that would handle traffic better, then may be developed, and the iterative process repeated.

Similarly, alternative highway networks may be tested. In developing alternatives for this study, forecasted levels of employment and dwelling units were tested against an assumed future transportation network. Adjustments were made to one or more combinations of employment, dwelling unit, or transportation variables, after analyzing model results. In this way the total amount of private development, including both employment and dwelling units, that can be accommodated by a specified transportation network at a uniform County-wide, total transportation, level of service has been established.

The results of this traffic modeling were examined for each of approximately two dozen Traffic Sheds as shown in Figure 2.4. These traffic sheds are defined by the way in which the road system functions, enabling isolation of traffic in one traffic shed from that of neighboring traffic sheds. The total traffic in each of these sheds, measured in terms of daily vehicle miles of travel (VMT), was examined relative to programmed and planned transportation improvements in the County and region.

Figure 2.5 shows the programmed and proposed major State and County road projects which were examined in this analysis. Included in the projected 1995 highway network are the following major projects: I-270 widening to 8-lanes to Montgomery Village Avenue; Intercounty Connector; Rockville Facility; Eastern Arterial; and Great Seneca Highway.

Estimates of the projected highway level of service, and total VMT, have been summarized by groups of traffic sheds. These groups of traffic sheds are used to form the eleven (11) designated policy areas within the County.

Figure 2.6 shows the pattern of traffic trends. Each set of bars on the map shows the projected increase of total daily VMT on all of the roadways in the policy area for the 1975, 1985 and 1995 time periods. The height of the bars is proportional to the percentage of the total VMT which is operating at a volume-to-capacity (V/C) ratio which corresponds to the highway level of service (LOS) of E or worse.

One pattern shown by the map is that most of the current and future travel occurs in the urbanized portions of the County inside the I-495 Beltway and in the I-270 and Route 29 Corridors. Within these urbanized areas the heaviest ADT volumes are in the Bethesda and Silver Spring Policy Areas. The highest ADT volumes also coincide with the lowest highway level of service as measured by percentage of VMT at LOS E or worse. For example, in 1975, Bethesda and Silver Spring had 30 percent to 40 percent of VMT at LOS E or worse while North Bethesda and Kensington-Wheaton had 10 percent to 15 percent at this level, and the other areas had practically no travel occuring under such congested conditions.

A second pattern shows significant increases in congestion projected to occur between 1975 and 1985. By 1995, the level of highway congestion is expected to stabilize or improve as new transporation improvements are implemented.

Transit Levels of Service

The second element in a total transportation level of service approach, is transit. Figure 2.7 shows the planned pattern of transit service availability categorized according to the dominant mode of access to the Metrorail service for each area of the County. Four distinct types of service areas are shown:

1) areas which can generally be expected to be too far away, or too low in density, to be served by direct transit access, and for which only park-n-ride access to transit would be available;

2) areas somewhat distant from rapid rail stations, but for which there is expected to be collector and regional bus access operated by the Washington Metropolitan Area Transit Authority (WMATA), as well as heavy reliance on park-n-ride access;

3) areas within a few miles of rapid rail stations, for which the dominant mode of access will be community bus service, such as the Ride-On service currently operated in Silver Spring, or collector buses operated by WMATA, or kiss-n-ride drop offs; and

4) areas in the immediate vicinity of rapid rail stations, where walk access will be the dominant means of getting to the regional transit service.

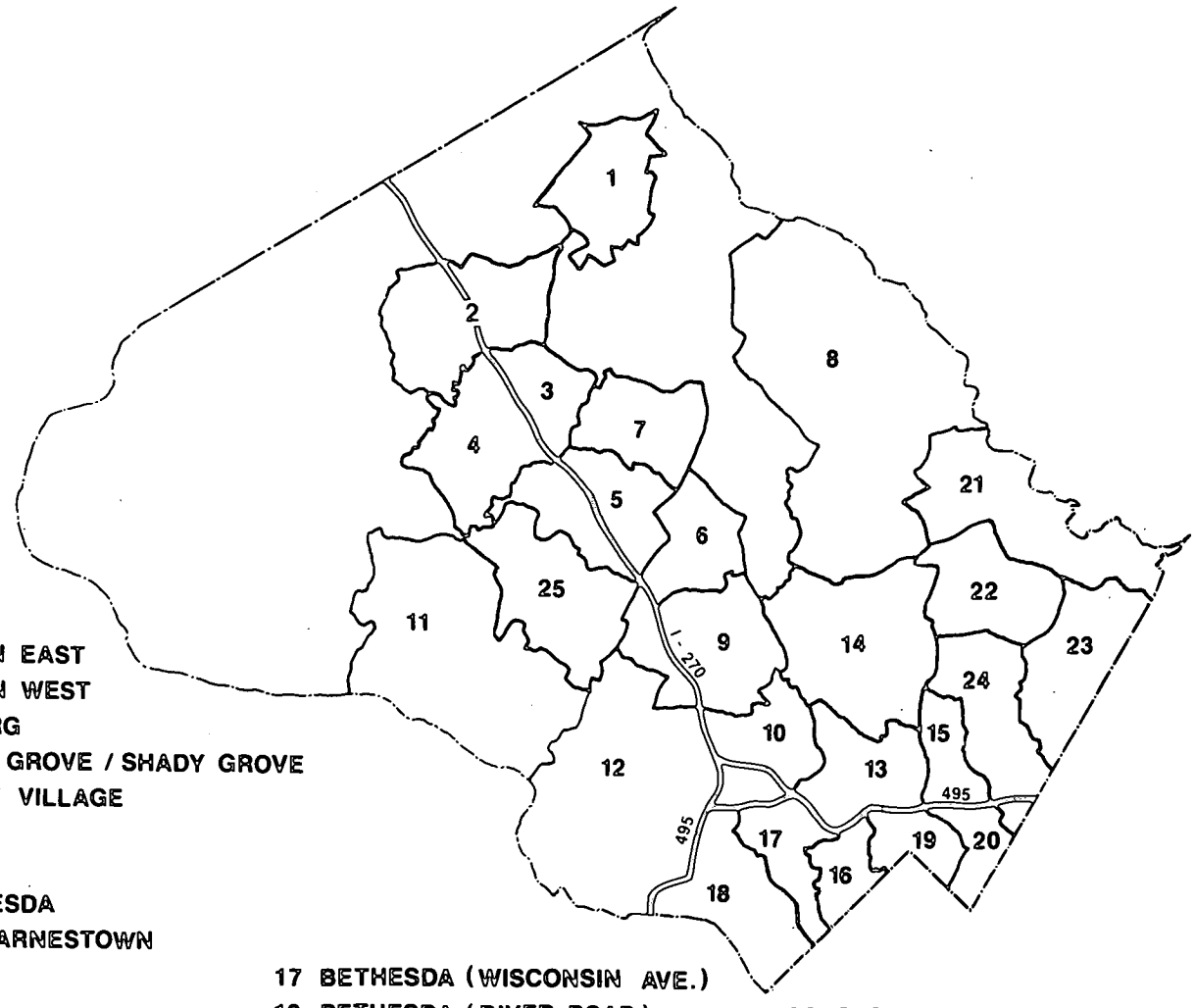
It is also of interest to examine the pattern of how much of the County's existing and forecasted development will be located within the walk, feeder bus/kiss-n-ride, regional bus and park-n-ride service areas of the transit stations. The existing distribution of residential households in the County, when aggregated by these transit service areas, shows that: (1) approximately 15 percent of existing households will be within walk access; (2) 52 percent will be within the community bus service area; (3) 28 percent will be within the regional bus area; and (4) only 5 percent will need to rely solely upon park-n-ride access.

Comparing the pattern of transit service availability, revealed by Figure 2.6, to the pattern of road congestion levels, revealed by Figure 2.5, we see that areas in which walk access and community bus are the dominant transit modes of access, are also those areas which have the highest levels of road congestion. The highest levels of highway congestion occur in the Group IV policy areas of Bethesda and Silver Spring, which concurrently have the highest level of transit availability. As the degree of transit availability decreases in Group III, II, and I areas, so does the level of highway congestion.

Similarly, the existing distribution of employment is highly concentrated relative to the transit system with: (1) 46 percent of current employment within walk access; (2) 32 percent within community bus access; (3) 19 percent within regional bus access; and (4) only 3 percent without any access except through park-n-ride.

Figure 2.8 shows how household and employment growth for the 1975 and 1995 time period is distributed with respect to mode of access to Metrorail. The incremental growth through 1995 follows a pattern similar to existing growth.

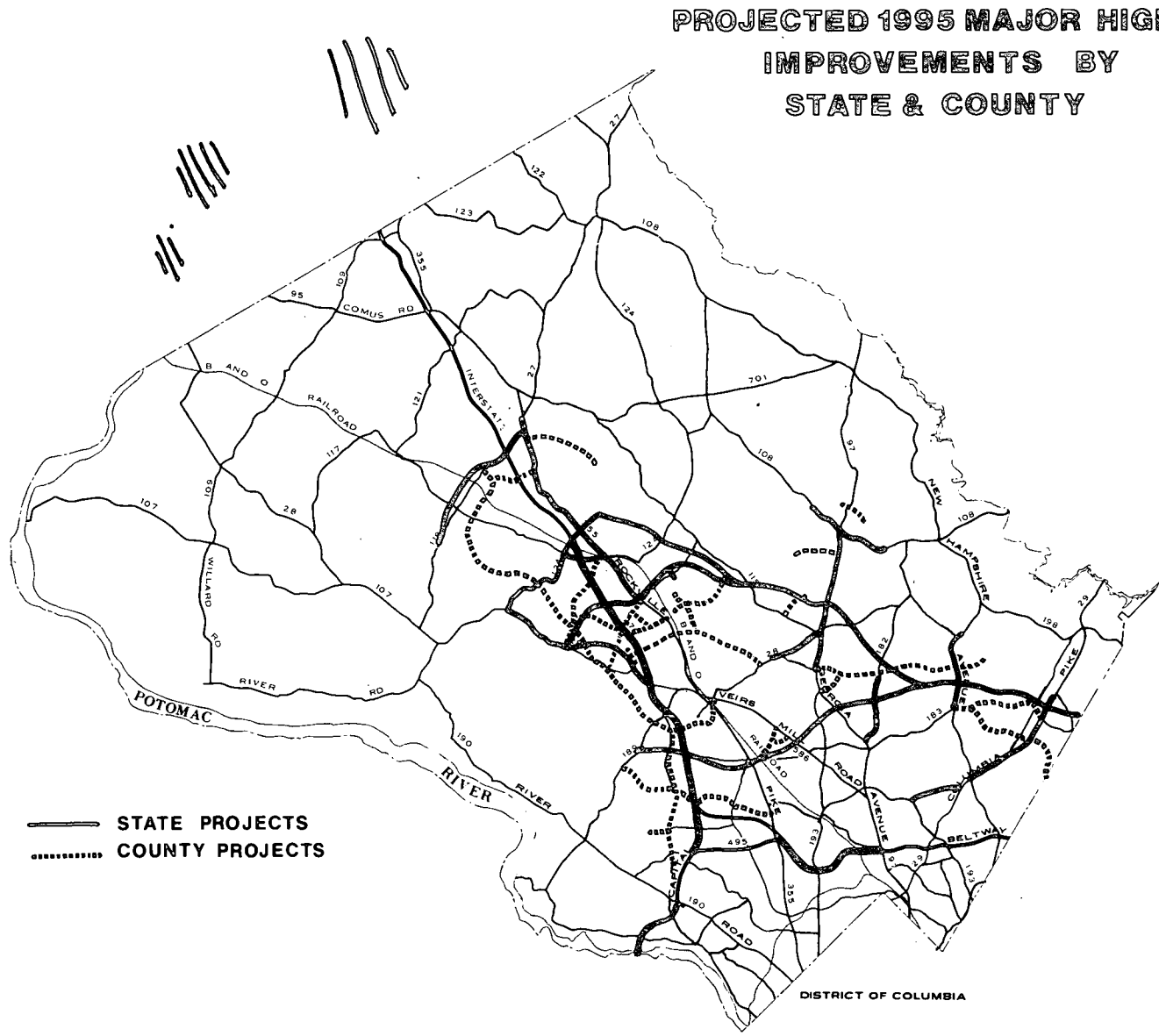
Figure 2.4



1 DAMASCUS
2 CLARKSBURG
3 GERMANTOWN EAST
4 GERMANTOWN WEST
5 GAITHERSBURG
6 WASHINGTON GROVE / SHADY GROVE
7 MONTGOMERY VILLAGE
8 OLNEY
9 ROCKVILLE
10 NORTH BETHESDA
11 TRAVILAH / DARNESTOWN
12 POTOMAC
13 WHEATON
14 ASPEN HILL
15 KEMP MILL
16 BETHESDA (CONNECTICUT AVE.)
17 BETHESDA (WISCONSIN AVE.)
18 BETHESDA (RIVER ROAD)
19 SILVER SPRING
20 TAKOMA PARK
21 PATUXENT
22 CLOVERLY
23 FAIRLAND
24 WHITE OAK
25 ROUTE 28

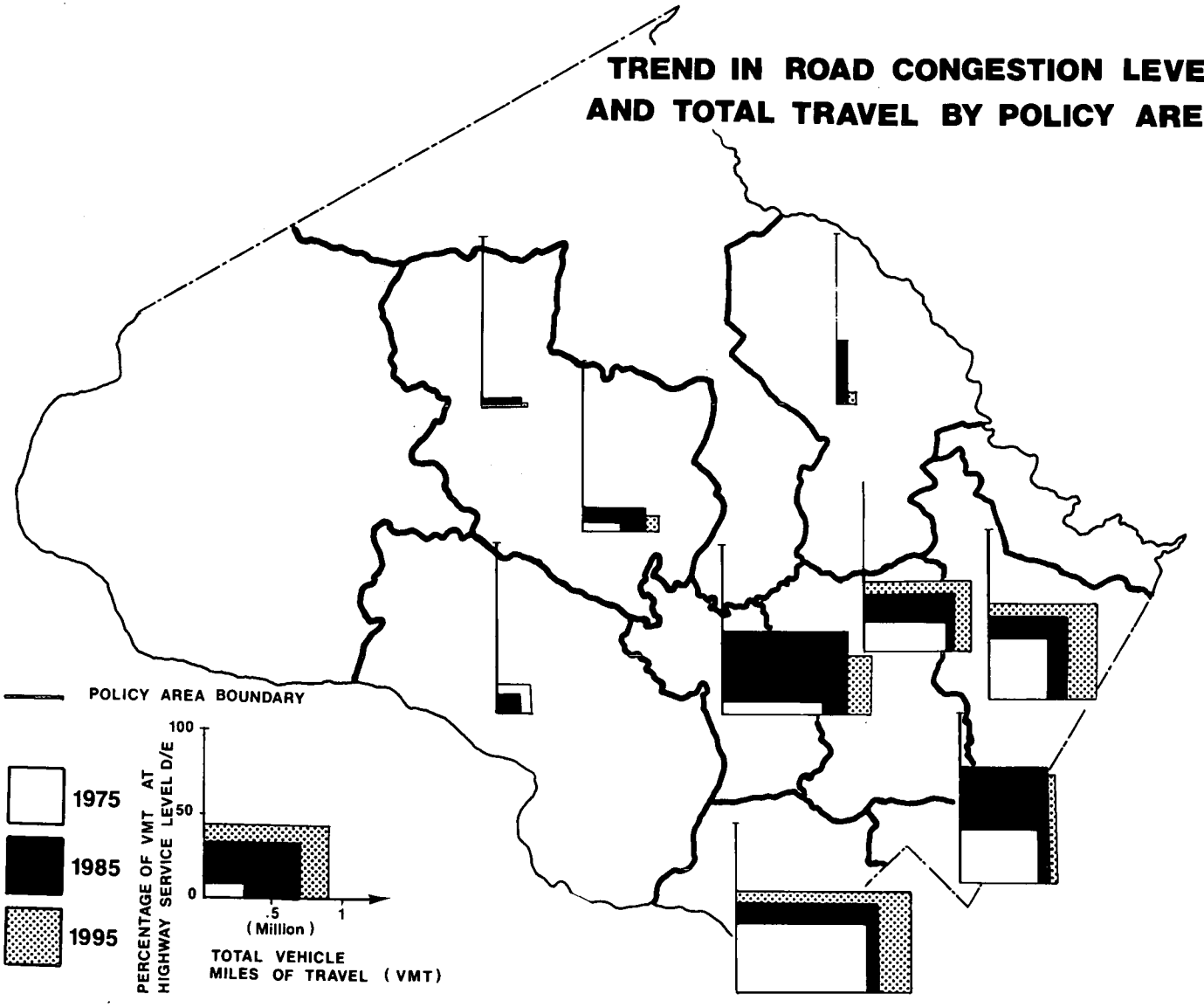
Source: Montgomery County Planning Board staff.

Figure 2.5



Source: Montgomery County Planning Board staff.

Figure 2.6



Source: Montgomery County Planning Board staff.

TABLE 2.6

TOTAL TRANSPORTATION SERVICE CONCEPT FOR POLICY AREA

Policy Area Group	Measurement Standards for Total Transportation Level of Service Concept: Highway Congestion Level Indicator*	Measurement Standards for Total Transportation Level of Service Concept: Transit Availability
I	0	Park-n-ride only.
II	10	Regional bus and/or commuter rail access as well as park-n-ridge.
III	50	Metrorail, regional bus, feeder bus, and community bus, kiss-n-ride.
IV	65	More frequent Metrorail, concentrated feeder and community bus, kiss-n-ride and easier walk access.

* Percent of VMT at LOS E or worse.

Future residential growth will be concentrated in the Shady Grove and Glenmont transit service areas with 80 percent of the households having accessibility via walk, community bus or regional bus modes. Future employment will be even more concentrated with 98 percent of jobs being accessible by walk, community bus or regional bus modes. In summary, both existing and forecasted households and employment will be well served by planned rapid rail and bus systems.

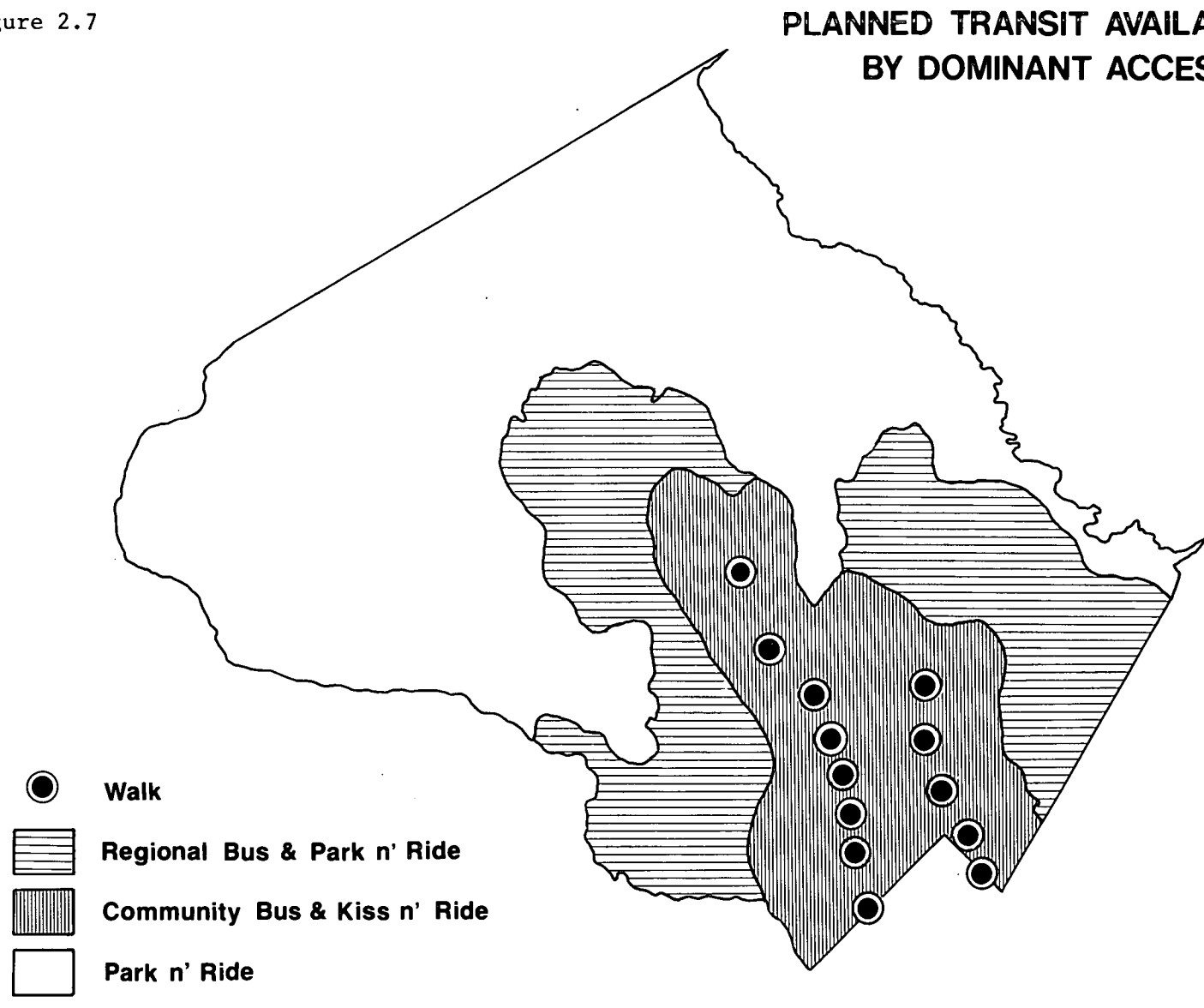
TRANSPORTATION STAGING METHOD AND POLICY GROUPS

If the map of policy areas boundaries, is overlayed on the map of relative transit service availability, a general correspondence between the two different kinds of boundaries can be seen. Those areas which have the highest levels of transit availability, are also those areas which are projected to have highest levels of total VMT, in both 1985 and 1995, as well as higher percentages of that travel under more congested conditions.

Four general groups of policy areas can be defined by the combination of the highway and transit components of the total transportation service concept, as shown in Table 2.6. This grouping of policy areas also relates fairly well to other general planning configurations in the County, such as the sewer service areas and the rural zone areas.

The criteria for developing transportation staging recommendations in Policy Area Groups I through IV is based on the percentage of projected VMT operating at level of service (LOS) E or worse conditions. Based on an analysis of existing levels of traffic congestion, forecast growth impacts, availability of transit service and normative highway design criteria a threshold standard was established for each of the four Policy Area Groups. The allowable percentage of VMT at LOS

Figure 2.7



Source: Montgomery County Planning Board staff.

E will be lowest in the Group I Policy Areas which have the least amount of transit availability. The allowable percentage will progressively increase for Group II, III and IV Policy Areas as transit availability increases.

Group I Policy Areas

These are outlying non-sewered areas where only park-n-ride transit availability is planned and where, on the aggregate, existing transportation capacity does not impose a constraint on development in the foreseeable future. The allowable percentage of VMT at LOS E, or worse, is zero (0%) percent. Staging in these Policy Areas will be based upon zoning, sewer policy and a review of aggregate transportation impact in succeeding staging plans.

Group II Policy Areas

These are developing fringe areas, which will have transit service in the form of regional bus and/or commuter rail access, in addition to park-n-ride. Here the acceptable percentage of VMT at LOS E, or worse should not exceed ten (10%) percent.

Group III Policy Areas

These are policy areas having an extensive range of transit availability. Here the acceptable percentage of VMT at LOS E or worse should not exceed fifty (50%) percent.

Group IV Policy Areas

These are policy areas having a full range of transit availability. Here the acceptable percentage of VMT at LOS E, or worse, should not exceed sixty-five (65%) percent. These areas are distinguished from Group III by having more frequent rail service, a more highly developed feeder bus network, and a higher percentage of households and employment within walking distance of Metrorail transit stations. As an example, the rail segments south of the I-495 Beltway are planned to have twice the frequency of services as those segments north of the Beltway.

Capital Program Assistance

An important benefit of the Adequate Public Facilities review is the insight it may provide to the State and County in carrying out their responsibilities for capital programming and the implementation of transportation improvements. In recent years, commentary from the Planning Board has focused on needed program funding levels, as well as needed individual road projects.

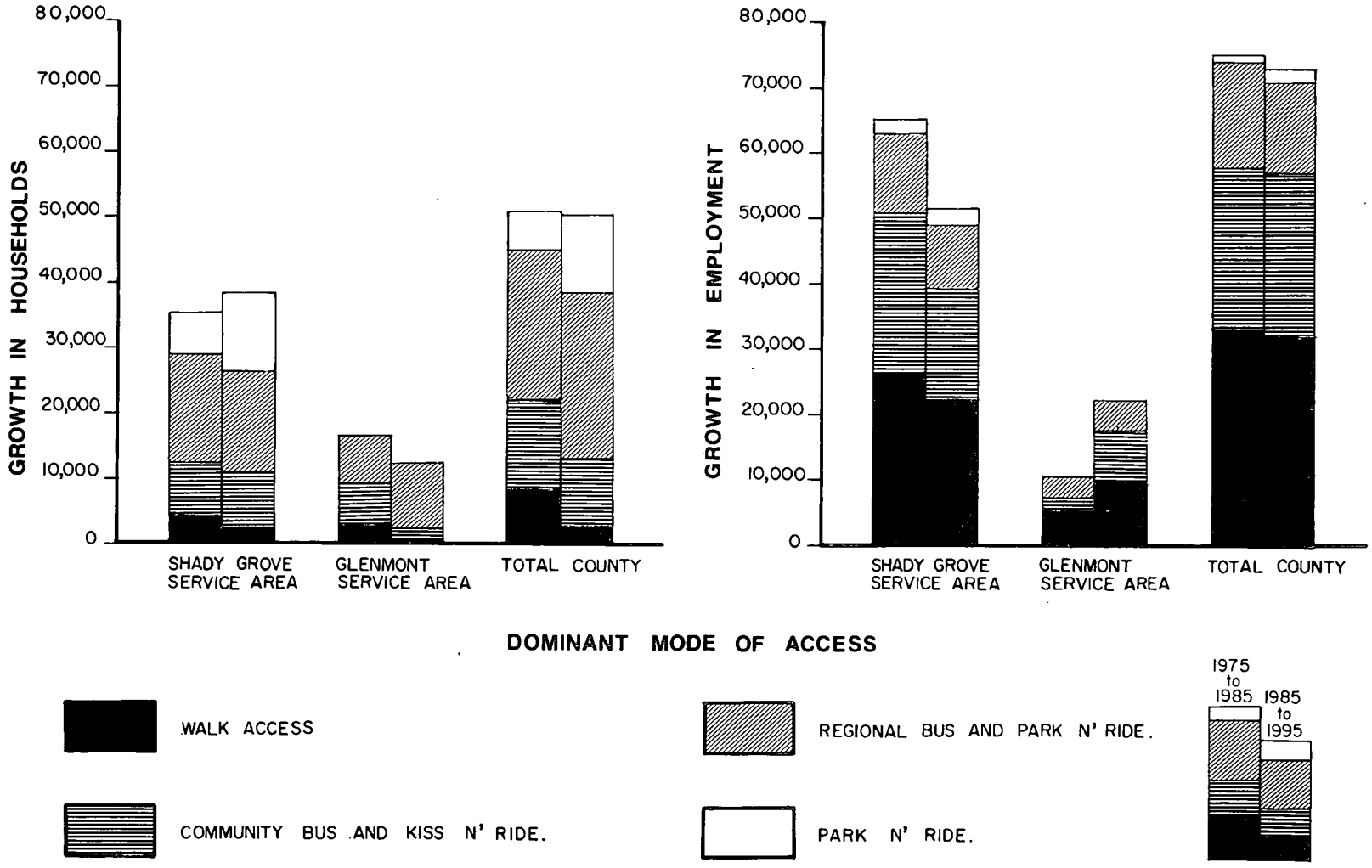
With regard to the State funding outlook, the picture is brighter than those of the past several years, although actual delivery of all of the needed improvements is contingent upon a restructuring and increases in State transportation revenues, so as to maintain a relatively constant purchasing power at today's level.

Some specific recommendations for priority projects for initiation of project planning are given. Direction to County capital programming is also given in terms of a listing of potential future projects. It can be used to provide a longer-term horizon for identifying major projects for inclusion in the CIP and for projecting future funding levels.

There is an important observation regarding the intergovernmental responsibility for transportation implementation that cannot be lost sight of in developing a Staging Plan. Most of the key projects related to the staging thresholds identified in the proceeding section are State road projects. Consequently, the County needs to work with the State to ensure the timely implementation of these transportation improvements.

Figure 2.8

HOUSEHOLD AND EMPLOYMENT GROWTH BY TRANSIT AVAILABILITY SERVICE AREA



Source: Montgomery County Planning Board staff.

Road Expenditure Levels

State and County major road expenditures were examined for the recent past, and the current program. Figure 2.9 presents these trends in average expenditures for three funding programs of the State: 1) interstate; 2) primary; and 3) secondary and special projects, as well as the trends for major County road expenditures including transit station access projects. The figure also shows the sources of information for the various time periods. The future expenditure levels for the Maryland Department of Transportation (MDDOT) are mostly based upon the proposed Consolidated Transportation Program and their recently adopted Maryland Transportation Plan.

The Maryland Transportation Plan examined the issues of statewide transportation funding needs and what levels of future expenditures may be within the capabilities of the MDDOT. A total statewide long range funding level of $6.9 billion has been targeted. This level assumes that there will be a restructuring of the transportation revenue sources to provide for a more constant purchasing power at approximately the current level of capital construction. There has been a bill proposed before the Legislature which would provide for a variable gasoline tax that would be inflation sensitive. This planned long range funding level of MDDOT would allow for the funding of currently programmed interstate, major primary and secondary projects within Montgomery County, as well as the Category 3 projects identified in the Maryland Transportation Plan. Those projects are the higher priority ones drawn from the longer-range needs studies which seem implementable within the next 20 year period given the funding assumptions.

The future expenditure levels shown in Figure 2.9 is keyed to the list of highway projects which are given in Table 2.7. That Table identifies groups of projects beyond the current capital programs for the 1985-1990 and 1990-1995 time periods based upon the analyses conducted for the Growth Policy. The total dollar estimate for implementing those projects was used to derive the average level of expenditures shown in Figure 2.9.

State Transportation Programs

The current and projected funding information and specific projects identified for the MDDOT Interstate and Primary Programs were obtained primarily from the Consolidated Transportation Program and the Maryland Transportation Plan. Current Federal legislation governing the Interstate Program requires that project planning for completion of projects be underway by 1983 and that construction be started by 1987. Consequently, the large level of program activities being programmed for the next decade reflects these federal deadlines.

However, some projects within this program could possibly be stretched out to a later time period in order to serve County growth. The major project in Montgomery County in the primary program is that of the Intercounty Connector/Rockville Facility. The corresponding expenditure level figure assumes that these needed projects would be programmed at that average expenditure level for a 10-15 year period, such that all of it is programmed for construction by 1995.

Clarification needs to be given regarding the funding outlook for these primary road improvements. Given the short-term Federal aid primary funding level available to the State of Maryland, this average implementation level for this project would constitute a major share annually of the Statewide funds. The overall funding level assumed in the Maryland Transportation Plan fully utilizes all available federal funds and provides for State expenditures in excess of that needed

to match federally funded projects. Consequently, it is assumed that this project will have sufficiently high priority from a Statewide perspective in order that there will be sufficient federal and state funds available to implement it. The Interstate Transfers, which were carried out several years ago, used funding available to this portion of the State to fund needed primary improvements in other portions of the State and were conditioned upon the Intercounty Connector/Rockville Facility receiving subsequent State primary road priority.

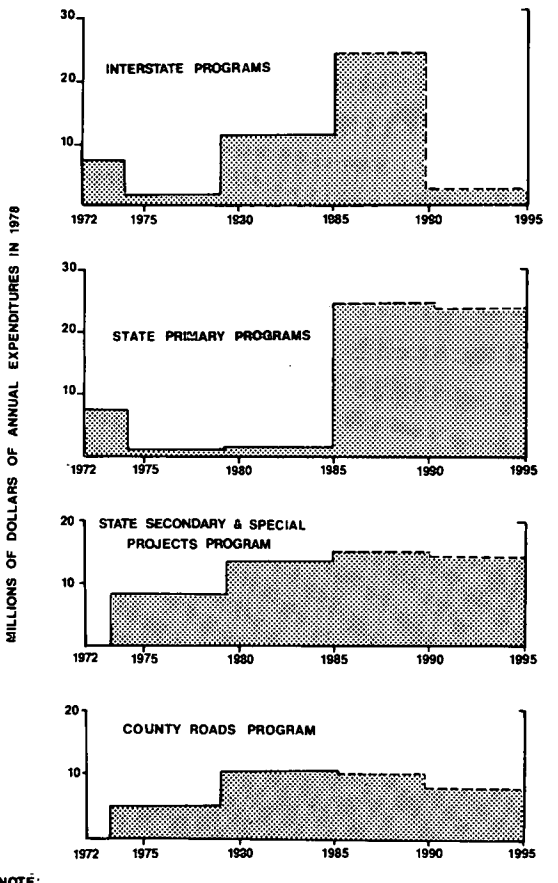
The State Secondary Program is associated with Category 3 projects of the Maryland Transportation Needs Study. They have been grouped into relative implementation priority based upon the analyses conducted for the Growth Policy. The number of projects indicated also reflects the administrative limitations of the MDDOT to initiate only a limited number of new project planning studies statewide in any given year.

The identified projects require that there should be, on the average, one new project planning start each year between 1980 and 1990 in order to assure that timely actions can be taken to program these projects for construction by 1995. The MDDOT should fund the necessary administrative capability to carry out that level of project planning in Montgomery County.

The average level of programmed expenditures, of approximately $14 million per year, reflects the combined expenditure efforts of the current fourteen secondary projects in the program for construction and the numerous special projects. It is expected that the funding effort on the special projects program, which is currently at a relatively high level, will decrease in later years of the program, and for several years beyond the current program having reached a temporary point of diminishing returns. However, additional needs will probably start to appear in the later years of our analysis. These relatively high capital funding re-

Table 2.9

PROGRAMMED & PLANNED MAJOR ROAD EXPENDITURES BY STATE & COUNTY FUNDING PROGRAMS



NOTE:
a. 1972 - 1978 ACTUAL EXPENDITURES
b. 1978 - 1985 PROGRAMMED MdDOT CONSOLIDATED TRANSPORTATION AND MONTGOMERY COUNTY CIP EXPENDITURES
c. 1985 - 1995 M-NCPPC STAFF ESTIMATES BASED ON MdDOT TRANSPORTATION PLAN AND ADOPTED SECTOR AND MASTER PLANS

Table 2.7

PROPOSED STAGING PLAN

CONSTRUCTION FUNDING SCHEDULE FOR STATE AND COUNTY HIGHWAY PROJECTS

COUNTY PROJECTS

COUNTY PROJECTS	Current Adopted Program FY 79-84	(Mill. $)	Future Projects[1] 1985-1990	(Mill. $)	Future Projects[1] 1990-1995	(Mill. $)
Major Roads	15 Projects in Program for Construction[4]	$37.0	Great Seneca Hwy.[2] Muddy Branch Road(2L) Seven Locks Road Democracy Blvd. Ext. Gude Drive[3] Gaither Road Fields Road	$27.9	Fields Road Muddy Branch Road (4L) Randolph Road Watkins Mill Road Tuckerman La. widening Twinbrook Pkwy. Briggs Chaney Road Good Hope Road Middlebrook Road Fairland Road	$25.0
Transit Access	10 Projects in Program for Construction[4]	$15.9	Parklawn Drive Aspen Hill Road Ext. Nicholson Lane Reedie Drive Kensington Blvd. Bucknell Drive Glenallen Avenue Twinbrook Pkwy. Belvedere Place Nebel Street	$ 9.6		
Other Road Projects	Traffic Improvements, Residential & Bridges	$ 7.6	Needwood Road Seminary Place[5] Prince Philip[5] Hines Road[5] Queen Elizabeth[5] Crabbs Branch Way[5] Traffic, Resi. & Bridges	$ 2.5 $ 9.0	Emory Lane Strathmore Ave. Good Hope Road[3] Ritchie Parkway[5] Executive Blvd. Ext.[5] Edson Lane[5] Traffic, Resi. & Bridges	$ 3.1 $ 9.0

(1) Recommendations of M-NCPPC Staff.
(2) PP, PE & R/W Runds in Current CIP totaling $7.5 million.
(3) See Adopted County CIP for details.
(4) City of Rockville Partial or Total Funding; No Costs Assigned.
(5) Possible Developer Projects--Schedule Accordingly; No Costs Assigned.

Table 2.7 (Cont'd.)

PROPOSED STAGING PLAN (Cont'd.)

CONSTRUCTION FUNDING SCHEDULE FOR STATE AND COUNTY HIGHWAY PROJECTS

STATE PROJECTS

STATE PROJECTS	Current Adopted Program FY 79-84	(Mill. $)	Future Projects[6] 1985-1990	(Mill. $)	Future Projects[6] 1990-1995	(Mill. $)
Interstate	I-495 Widening I-270 Interchanges Falls & Montrose	$51.6	I-370 Connector I-270 Widening to Mont. Village Ave.	$119.2	I-270 Widening to Germantown	$ 10.0
	Safety & Noise Projects	$20.0	I-495 Cabin John Bridge			
Primary	Spencerville Rd	$ 5.3	ICC & Rockville Facility	$122.0	ICC & Rockville Facility	$120.0
			US 29 to Briggs Chaney	$ 4.6	US 29 to Route 198	$ 2.9
Secondary	14 Projects in Program for Construction[7]	$43.0	Georgia Ave. to Route 108 Eastern Arterial Route 355 Bridge		New Hampshire Ave.[8] W. Diamond Ave.[8]	
	Special Projects	$37.5	New Hampshire Ave.[8] Route 28 Relocated[8] Route 118 Route 124 Relocated[8]	$ 67.1	Quince Orchard Rd.[8] Rte. 355 to Germantown[8] Route 108 thru Olney[8] US 29 Spur[8]	$ 59.9
			Special Projects	$ 5.0	Special Projects	$ 10.0

(6) Recommendations of M-NCPPC Staff.
(7) See Adopted SHA 5-Year Program for details.
(8) Not in Adopted SHA Program for Project Planning.

Source: Montgomery County Planning Board staff.

sources going into the special projects would more appropriately be invested in major new improvements in secondary roads and consequently have been shown as a combined funding program.

We want to again make note that the funding levels identified in the Maryland Transportation Plan are predicated upon the department receiving increases over the next 10-20 years in some of their major revenue sources, in particular, the gasoline taxes such as to maintain the current purchasing power. Failure to receive such revenue increases will jeopardize some of the needed transportation projects identified in the transportation staging threshold analyses. Consequently, continued attention and support should be given to assuring that there are adequate resources available to the MDDOT to provide needed public facilities on a timely basis here in Montgomery County.

Newly enacted procedures governing MDDOT project planning and capital programming require that local elected officials establish the priority order for the secondary system project planning starts from among projects listed in the Needs Inventory. The Planning Board recommended to elected officials that project planning be initiated on the widening of Georgia Avenue from Norbeck to Olney. This project represents the transportation staging threshold for the Olney Policy Area. Inclusion of the project in the program for construction would enable growth to occur up to the level proposed in the new draft master plan.

The new procedures for establishing a priorities list of secondary system project planning starts is not yet fully operational in this year of transition, pending the establishment of a County Needs Inventory next year by MDDOT. The Planning Board felt that it was necessary to give some interim direction to the local elected officials, as well as to the State officials regarding priority projects for which they should begin preparing draft and final systems planning reports during the coming year.

Based upon the transportation staging threshold analyses three (3) key projects are identified: a) the widening of New Hampshire Avenue north of Randolph Road to Bonifant Road; b) MD 28 Relocated from I-270 to Quince Orchard Road; and c) the widening of US 29 from White Oak to Briggs Chaney Road. Subsequent priority recommendations for other state projects will be made in conjunction with the development of the initial Needs Inventory that MDDOT is required to prepare next year.

County Transportation Program

There is no institutionalized means for projecting County Road needs beyond the current six year Capital Improvements Program (CIP). This is compounded by the general observation that County road projects tend to have a shorter implementation time span and a lower expenditure level than the average state road project. There is a tendency to have expenditures for projects in the earlier years of the Capital Program and an apparent hesitation to identify needed projects in the later years of the program. Consequently, there is a need to have a process with a longer term and County-wide focus which can identify potential candidate projects to possibly be included in future Capital Programs.

The current average level of expenditures indicated in the current County CIP is approximately twice the average level of expenditures experienced in the past five to six years. The projects identified for future County programs have a total average level of expenditure in each of the two time periods which is somewhat less than the current programmed level of expenditure.

Table 2.8 gives a listing of candidate projects for the County to consider for inclusion in their future Capital Program. These projects are grouped for two time periods, that of 1985-1990 and for 1990-1995, during which time it is recommended that they be programmed for construction. The programming of a project for construction is a significant CIP action. Under the Adequate Public Facilities Ordinance, it allows private development to proceed based on a County commitment to provide appropriate facilities. These Growth Policy recommendations provide a framework for such capital programming decisions.

Implementation of County operated transit services must also be considered in the CIP process. This Growth Policy assumes that community bus systems will be operational in Group III and IV Policy Areas to provide access to Metrorail. The Sequel Report to the Second Annual Growth Policy Report, 1975, outlines the extent of these systems. The concepts of that report were used in implementing transit access to the Silver Spring Station in 1978 and should also be utilized in implementing feeder service for the Shady Grove and Glenmont extensions.

Table 2.8

CANDIDATE PROJECTS FOR INCLUSION
IN THE CAPITAL IMPROVEMENT PROGRAM OF THE COUNTY

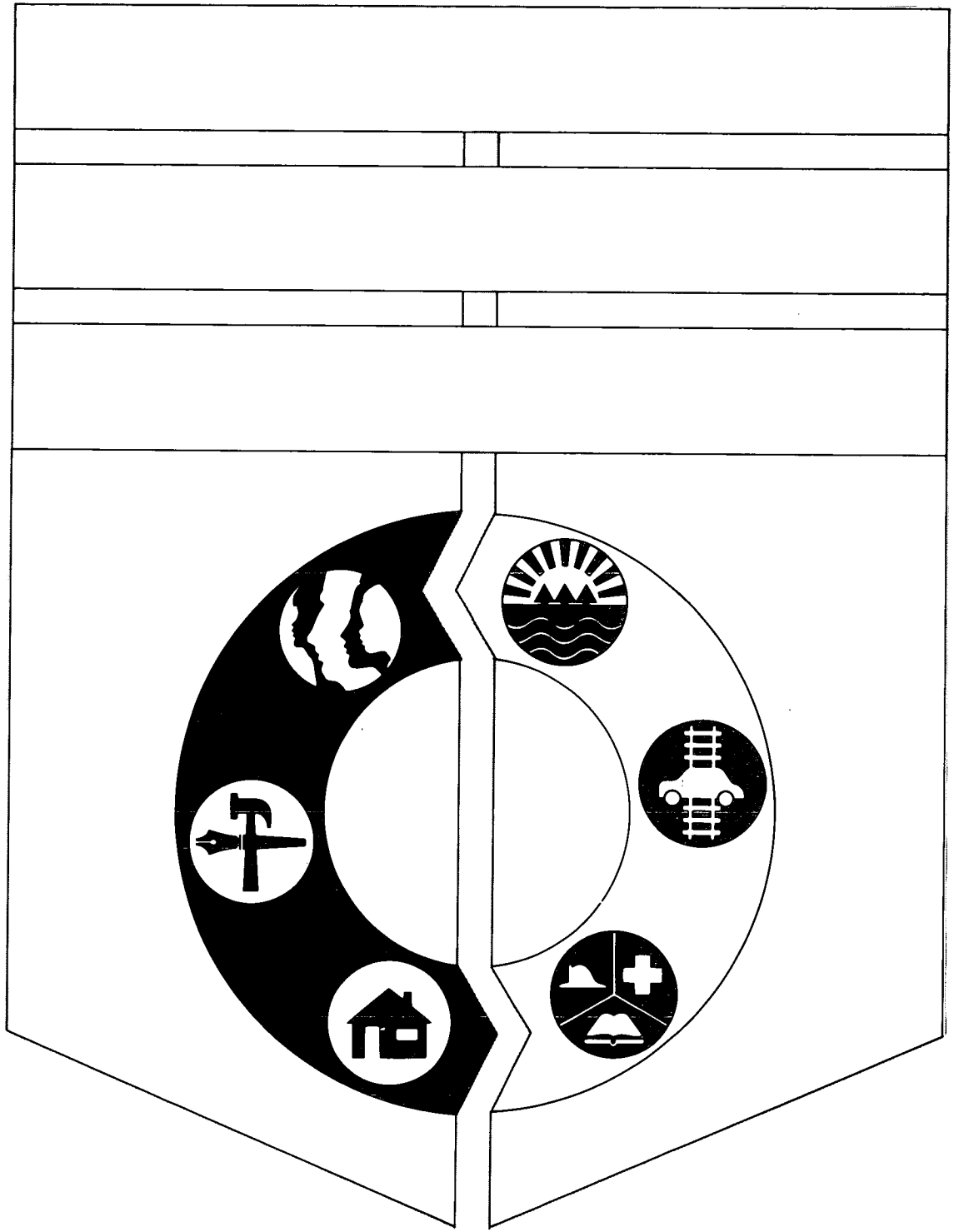
1985-1990 Time Period

Major Roads		
Great Seneca Highway	4LD	MD 28 to Middlebrook Road
Muddy Branch Road	2L	MD 28 to West Diamond Avenue
Seven Locks Road	4L (add 2L)	Tuckerman Lane to Montrose Road
Democracy Boulevard Ext.	2L	Gainsborough Road to Kentsdale Drive
Gude Drive	4LD (add 2L)	MD 355 to Piccard Drive
Gaither Road	4L	Shady Grove Road to Fields Road
Fields Road	4L	Piccard Drive to MD 355
Transit Access		
Parklawn Drive	4L	Twinbrook Parkway to Metro Station
Aspen Hill Road Ext.	4L	Veirs Mill Road to Twinbrook Parkway
Nicholson Lane	5L (add 1L)	Old Georgetown Road to Rockville Pike
Reedie Drive	4L (add 10')	Veirs Mill Road to Amherst Avenue
Kensington Boulevard	2L	Veirs Mill Road to East Avenue
Bucknell Drive	2L	Connect existing
Glenallen Avenue	4L (add 10')	Georgia Avenue to Layhill Road
Twinbrook Parkway	6L	MD 355 to Veirs Mill Road
Belvedere Place Nebel Street	4L	Connect existing roadway
Other Projects		
Needwood Road	2L	Redland Road to MD 115
Seminary Place	2L/4L	Seminary Road to MD 97
Prince Philip Drive	2L	MD 108 to MD 97
Hines Road	2L	MD 97 to Cashell Road
Queen Elizabeth Drive	2L	MD 108 to MD 97
Crabbs Branch Way	4L	Redland Road to Gude Drive

1990-1995 Time Period

Major Roads		
Fields Road	4LD	Muddy Branch Road to Shady Grove Road
Muddy Branch Road	4LD (add 2L)	MD 28 to West Diamond Avenue
Randolph Road	4LD	MD 650 to Prince George's County
Watkins Mill Road	4L	MD 355 to MD 355
Tuckerman Lane Widening	4L (add 2L)	Falls Road to Seven Locks Road
Twinbrook Parkway	6LD	MD 355 to B-&-O/Ardennes Avenue to MD 586
Briggs Chaney Road	4L (add 2L)	MD 650 to US 29
Good Hope Road	2L	MD 650 to Briggs Chaney Road
Middlebrook Road	4LD	MD 188 to MD 355
Fairland Road	4L	Randolph Road to US 29
Other Projects		
Emory Lane	2L	MD 155 to Cashell Road
Strathmore Avenue	4L	Leland Avenue to Bradley Boulevard
Good Hope Road	4L	Briggs Chaney to MD 198
Ritchie Parkway	4LD	MD 28 to MD 355
Executive Boulevard Ext.	4L	Nicholson Lane to Security Lane
Edson Lane	2L	Executive Boulevard Ext. to MD 355

Source: Montgomery County Planning Board staff.



Chapter Three

Forecast

FORECAST 3

INTRODUCTION

In order to use the transportation and sewerage facility models, it is necessary to have forecast models that can distribute jobs, housing and population to both sewer sheds and traffic sheds. Since these two kinds of units overlap each other in a crazy quilt kind of pattern, it is necessary to develop a smaller unit, that can be aggregated up in different combinations to either a sewer shed or a traffic shed. This unit of land area was developed as a part of the land use data bank mentioned above, and has been hooked into another set of linked models of the private sector growth process.

These latter models essentially work on the premise that jobs are the primary driver of metropolitan growth, and that population migrates to the metropolitan area in proportion to this employment market. Once the population has decided to make a job related move, it looks for housing; and the anticipation of this housing purchase market by the development industry is the driver of housing growth. There are feedback loops of influence among these three private sector systems which also have to be accounted for in reaching a final forecast estimate.

There are some difficulties in developing simulation models that can accurately reflect the feedback influence among these three systems. One of the reasons is that the real world systems themselves are only partially integrated with respect to one another. For instance, the population system is governed only indirectly by the job and housing conditions. People may consult the local housing market before deciding to

move to a metropolitan area to assume a new job; but they are far less likely to examine either the job or housing systems when they engage in the creation of the next generation. The number and kind of jobs in the local economy are driven by a number of factors, that range upwards from the decisions of the existing local employers, through the realms of trade, technology, banking, to perhaps ultimately the gnomes of Zurich, as some economists have suggested.

These economic and monetary decisions are not necessarily well integrated with the decision points of the population and housing systems. Changes in the housing supply must come about through the actions of the development industry, which contrary to being a highly structured one, is rather a somewhat loose confederation of a large number of small and medium volume builders, who each tend to limit themselves to separate sub-segments of the market (e.g., single-family, condominium, etc.). Being frequently undercapitalized, unable to afford depth of market research, and subject to being caught short by sudden shifts in mortgage supply, the industry traditionally must cope with periodic cycles of over-commitment and subsequent retrenchments.

All of the above factors apply to forecasting at the metropolitan scale. When we attempt to forecast at the local jurisdiction scale, a further complication must be dealt with. Namely, that neither the job market nor the housing market necessarily relate to each other within a local jurisdiction, in the same manner in which they relate to each other at the metropolitan scale. In other words, while the job supply and the housing supply may be in balance with each other in a metropolitan area taken as a statistical whole, they may be considerably out of balance with each other within any given local jurisdication in the whole. Therefore, in terms of forecasting the two systems for any local jurisdiction, the localizing effects, which may skew the internal distribution patterns of the metropolitan area, will have to be taken into account.

A basic methodology for grappling with these uncertainties has been described in the 1976 Growth Policy Report called Forecast; and is further described, with current results in this chapter and a forthcoming Forecast Report. In essence, this methodology consists of an approach, in which the Planning Board staff develops our own County forecast, by relying heavily on housing market trends and the known intentions of the development industry, as monitored through a statistical tracking system that measures the "pipeline" of zoning, subdivision applications. Using a census demographic model, such housing forecasts are convertible to population forecasts by age, sex, etc. These, in turn, can be geographically allocated to the relatively small subareas of the County, used in the land use data bank as the conversion areas between the sewerage and transportation models.

Since employment forecasting must be done at the County level with less of a pipeline weather vane for a guide, it must rely on a combination of trend extrapolation and informed judgements, until such time as a better technique can be developed. One approach would be to involve the business interests of the County to assist in forecasting an employment profile by subareas.

The current method, assuming it uses adequately realistic assumptions, is reasonably reliable for relatively short term forecasts, up to about five years or so from the present. Beyond this, however, the uncertainties among the relationships begin to multiply, to the point where it is necessary to step up to a larger statistical base, in order to retain any confidence in a statistical extrapolation approach. The Planning Board staff have worked extensively at trying to perfect a cooperative forecasting process at the metropolitan scale, through

the Council of Governments, in order to achieve this objective.

This approach essentially seeks to model employment for the region as a whole, working from national trends, amended by locally known conditioning factors; and, from this, derive reasonable estimates of correspondingly appropriate housing and population totals. These metropolitan-wide total statistical estimates, called "projections," can then be used as a "top down" benchmark level, against which the aggregate of all the local jurisdications' individual forecasts can be compared. Once the totals are roughly in balance, then a "reconcilation" process is undertaken, involving a shared modeling approach, by which in a cooperative manner the planning staffs of the different jurisdictions can constructively compete. The individual forecasts of all jurisdictions are analyzed to ultimately arrive at a concensus decision about a forecast for each jurisdiction that is reconciled with the forecast benchmark for the region as a whole.

While this process is working well and has just produced its second round of reconciled regional and local forecasts, it can only work, if everyone involved clearly understands the range of uncertainty that must be associated with the longer range forecast. For this reason, it has been agreed that the cooperative forecasting process will produce both a high, low, and intermediate, or most probable forecast for the long range periods beyond five years. A general public understanding and acknowledgement of the necessity to condition forecasts with such a range of uncertainty provision becomes another necessary ingredient in the development of a comprehensive staging plan.

Summary

This Chapter provides a general overview of Montgomery County's revised forecasts. A more detailed description of the forecasts and methodology is included in a forecast report which is to be published separately.

While Montgomery County's forecasts are updated annually, revisions are programmed to coincide with the adoption of new regional forecasts by the Council of Governments (COG).

In 1975, the COG Cooperative Forecasting Program was initiated. This program climaxed earlier efforts to develop regional and local area forecasts which would be mutually compatible and consistent with one another. The heart of the program lies in the twin goals of developing professionally sound regional and individual local area forecasts in which the associations among them are consistent and reliable. A common set of forecasts provides a framework for analyzing and making crucial decisions about the many functional programs, including water resources, land use and housing, air quality and transportation. It is anticipated that the forecasts will assist in the coordination of growth policy efforts of local governments with one another and with the state and federal government.

As part of its on-going program to periodically monitor and update the forecasts, COG and its member jurisdictions have recently completed a Round 2 Cooperative Forecast. This latest forecast updates the earlier forecasts and extends the time horizon to the end of the century.

COG Round 2 Cooperative Forecast also introduces a new forecasting concept. Instead of providing only a single estimate, as in Round 1, three forecasts are presented based on alternative assumptions of future

COMPARISON OF ROUND 1 AND ROUND 2
COG Cooperative Forecasts
MONTGOMERY COUNTY

ROUND 2

Intermediate Growth

	1980	1985	1990	1995	2000
Household Population	590,300	627,100	675,100	729,400	770,000
Group Quarters	9,700	11,900	14,400	17,100	20,000
Total Population	600,000	639,000	689,500	746,500	790,000
Average Household Size	2.86	2.76	2.70	2.68	2.67
Households	206,100	227,500	250,000	272,500	289,000

High Growth

	1980	1985	1990	1995	2000
Household Population	599,800	670,600	733,100	789,000	846,000
Group Quarters	9,700	11,900	14,400	17,000	20,000
Total Population	609,500	682,500	747,500	806,000	866,000
Average Household Size	2.86	2.78	2.73	2.70	2.69
Households	209,575	241,000	268,275	292,700	314,500

Low Growth

	1980	1985	1990	1995	2000
Household Population	582,300	601,600	627,100	650,000	672,000
Group Quarters	9,700	11,900	14,400	17,000	20,000
Total Population	592,000	613,500	641,500	667,000	692,000
Average Household Size	2.85	2.73	2.66	2.65	2.65
Households	204,500	220,700	235,400	245,400	253,700

Employment

	1980	1985	1990	1995	2000
Intermediate	286,000	326,000	371,000	403,000	440,000
High	287,100	331,100	375,000	414,000	460,000
Low	285,300	324,800	367,000	391,000	419,300

ROUND 1

Intermediate

	1980	1985	1990	1995
Total Population	608,600	677,800	716,600	757,700
Households	213,800	243,800	261,500	281,700

Trend (High)

	1980	1985	1990	1995
Total Population	608,600	739,600	801,500	846,500
Households	213,770	263,770	293,770	313,770

Employment

	1980	1985	1990	1995
Intermediate and Trend (High)	288,500	323,500	354,900	397,400

Prepared by: Montgomery County Planning Board

growth after 1980. These forecasts assume circumstances which will lead to growth rates which range from low to high with an intermediate (or most probable) growth rate in between. Single figure projections provide no measure of the range of uncertainty which is associated with the forecast, particularly those in the more distant future. Long term projections are typically less reliable due to the necessity of determining today, future underlying influences on society and the economy.

The economy of the Washington area, as well as Montgomery County, is closely tied to that of the nation and the state. Although the COG Forecasts rely on national projections in anticipating future trends, it is unrealistic to assume that there will be no unforeseen changes in the social and economic environment. We cannot anticipate, with certainty, underlying trends in the social fabric of our society such as marriage and divorce rates, the rise in one-person households, continued growth of women in the work force, migration patterns, fertility rates, etc. On the economic scene, the future is also clouded by uncertainties about the impact of the energy crisis, inflation which hangs like a hydrogen bubble over the economy, the impact of proposition 13 type legislation on federal, state and local programs, etc.

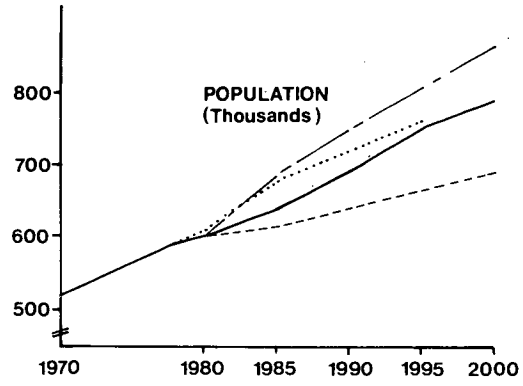
By providing three estimates of growth, the range of uncertainty is demarked by high growth and low growth boundaries with an intermediate or most probable growth forecast in between. An analysis of Round 1 forecasts suggest that they are comparable with Round 2 high growth forecasts. Planners for projects, particularly those which require long lead times or are designed for long term use, may want to perform a "risk" analysis for each of the alternative projections in order to minimize costs or risks.

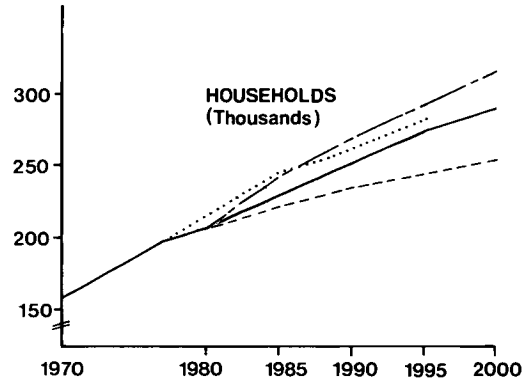
Although the general procedures used in developing

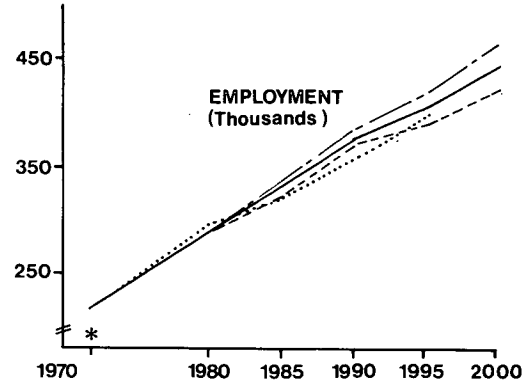
COG COOPERATIVE FORECAST

COMPARISON OF ROUND 2 AND ROUND 1 FORECAST

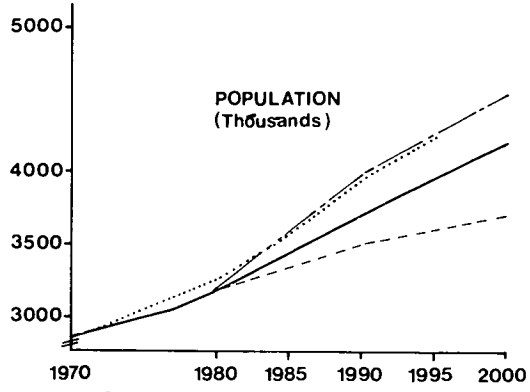
MONTGOMERY COUNTY

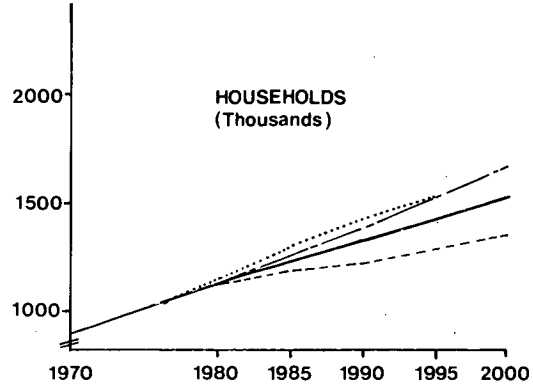


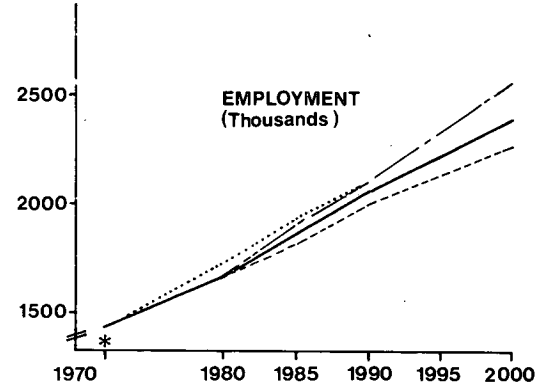




WASHINGTON REGION**







LEGEND

Round 1 forecast .....

Round 2 high — · — · —

Round 2 intermediate ———

Round 2 low - - - - - -

* 1972 COG EMPLOYMET CENSUS

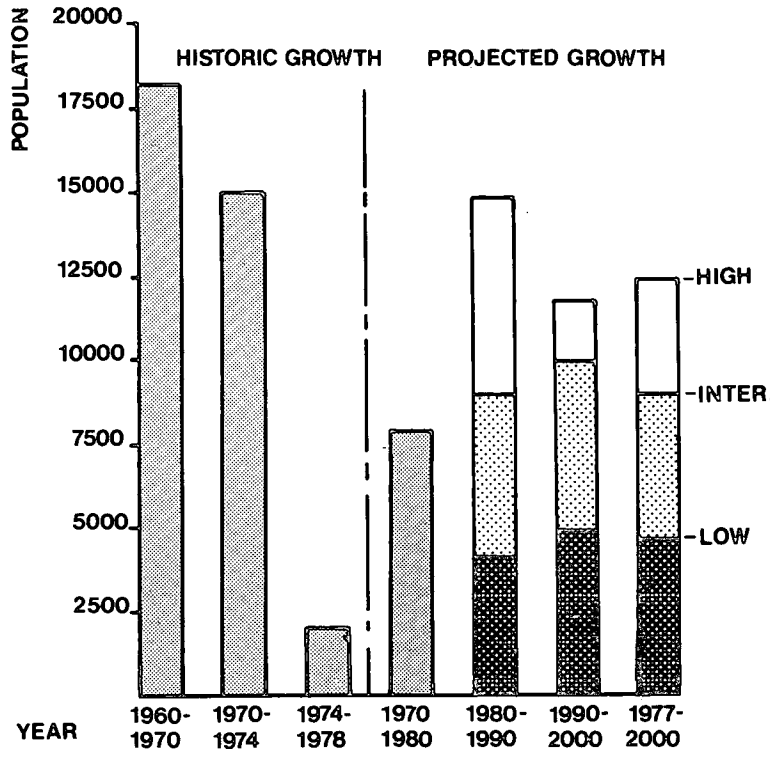
** As defined in 1970

Source : Montgomery County Planning Board Staff

MONTGOMERY COUNTY

ANNUAL AVERAGE GROWTH

POPULATION



SOURCE: MONTGOMERY COUNTY PLANNING BOARD STAFF

Round 2 forecasts were similar to those followed in Round 1, technical advances made in the earlier forecasting models and the advantage of more recent observations of trends in the economy have benefited the process.

COG Forecast of population, households and employment to the Year 2000 for the Washington Region and for member jurisdictions are presented in this report.

In addition, ten-year forecasts beginning with 1978, disaggregate the County forecasts by geographic subdivision. These ten-year forecasts are an update of the series of forecasts which have been prepared annually by the Montgomery County Planning Board staff. Analysis of these data, together with resource availability (e.g., water, transportation, etc.) now feasible through computerized programs, makes it possible to develop a staging element for the general growth plan. The purpose of a staging element is to coordinate private development with the extension of public facilities so that public facilities will not be provided at a faster or slower rate than needed. This should help in keeping revenues and expenditures in balance.

Major Growth Trends

Population

The number of people residing in the County as of January 1978 is estimated at 593,500, an average growth rate of almost 8,800 per year since 1970. The rate of growth since 1970 has been uneven, with an average of 15,000 persons added each year between 1970 and 1974, compared to an average increase of only 2,000 per year over the past four years. The first four years of the decade of the 1970's saw a continuation of the very rapid growth of the 1960's in which an annual

average of 18,200 persons were added to the County's population. The recent drop in population growth has been attributed to the sewer moratorium, scarcities of mortgage money, inflation and other economic factors which prevented the construction of the new homes needed to offset declines in household size and out-migration. Forecasts of future growth assume that many of the physical constraints that restricted growth over the past five years will be remedied.

Annual average growth in population to the Year 2000 is expected to range between a low of 4,700 to a high of 12,300 with an intermediate, or most probable, average annual increase of 9,000.

The percentage growth in the County's population between 1977 and the Year 2000 is expected to be between a low of 18 percent and a high of 48 percent, thereby keeping pace with the forecasted Washington area growth of 21 to 48 percent. In other words, the share of the Washington area's population residing in the County is expected to remain substantially unchanged.

Within the Washington region, the core area (D.C., Arlington and Alexandria, Virginia) is forecast to average annual increases of 3,100 (low) to 6,400 (high) to the Year 2000. The core area, which had a decline in population in the decade of the 1970's, is expected to reverse this trend in the 1980's with relatively modest increases which will continue until the end of the century. The exurbs (Loudoun and Prince William Counties, Virginia) are expected to have the largest percentage gains from the relatively small population totals of the 1970's. The suburban areas of the region (Prince George's, Montgomery Counties, Maryland and Fairfax County, Virginia) are expected to have the largest numerical gain in population. Their share of the total region's population is expected to increase from 58 percent in 1970 to almost 63 percent in the Year 2000.

Households

The size of households residing in the County and their characteristics have implications for the nature of services and facilities that are needed. Declines in fertility, both nationally and within the region, have been accompanied by an equally important drop in household size. There has been a sharp increase in the number of one person households due, in part, to the increase in the divorce rate; increases in the number of young adults born during the "baby boom" of the 1950's who have left their "nest," and finally an increase in the number of older residents who have lost their spouse and are now living alone.

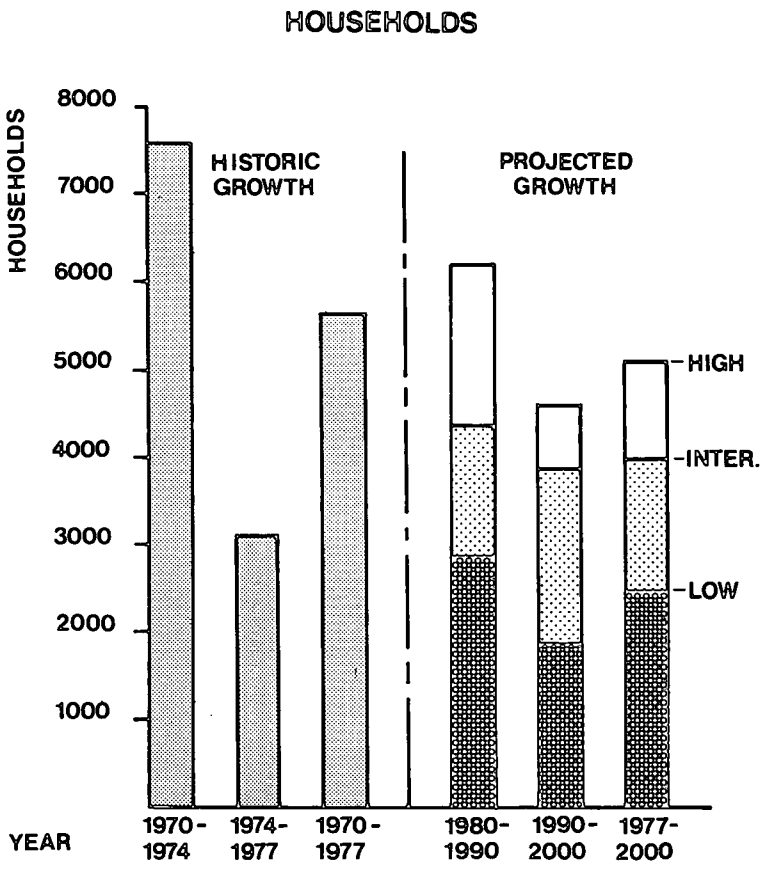
Between 1970 and 1977 the number of households in the County increased by 39,600 for an annual average increase of almost 5,700. Growth during the first four years averaged close to 7,600 annually compared with 3,100 during the 1974-1977 period.

Household growth in the County is not expected to match the 1970-1974 growth experience. Between 1977 and the end of the century, the average annual increase is expected to be between a low of 2,500 and a high of 5,100 households. The period of highest growth is expected to occur during the 1980's when the "baby boom" generation may play a more important role in the housing market.

Although household growth is expected to be below the 1970-1974 experience, the forecast envisions that the percentage increase in households will exceed population. Households are expected to grow by between 29 and 60 percent by the Year 2000, whereas population is expected to increase by between 18 and 48 percent.

With households increasing at a faster rate than population, average household size is expected to continue to decline and level out in the 1990's. In 1970,

MONTGOMERY COUNTY
ANNUAL AVERAGE GROWTH



SOURCE: MONTGOMERY COUNTY PLANNING BOARD STAFF

there was an average of 3.30 persons per household; by 1977 it had declined by 11 percent to 2.93. By the end of the century, average household size is expected to decline to between 2.65 (low) and 2.69 (high) for a decline of 9.6 and 8.2 percent, respectively.

Household growth in the County is expected to keep pace with the overall Washington region over this time period. However, it is expected to trail the growth rates in the jurisdictions of exurbia and Fairfax County, Virginia. The core area is expected to show moderate increases in the number of households to the Year 2000 with increases ranging from a low of 16 percent to a high of almost 26 percent.

Employment

The County has earned a national reputation for providing industry with attractive surroundings in close proximity to the nation's capital, good schools and a supply of well trained, well educated professional employees. These advantages will probably continue to attract national firms seeking to locate in this area, as well as to encourage expansions in existing firms.

Over the next ten years to 1988, employment is projected to increase by 82,000. This increase is below the average annual increase of almost 11,100 recorded in the 1970-1978 period. Employment in the 1990's is expected to continue to grow but at a reduced rate as the County continues to mature.

The continued growth in jobs is expected to be fueled by growth in the services sector, which is the largest employment sector in the County. This group, which accounts for 25 percent of total jobs in the County, includes such diverse activities as computer and data processing, research and development laboratories, amusement and recreation services and other personal and miscellaneous services. Retail trade, which is the

second largest employment sector, is also expected to grow but at a reduced rate. The number of federal employees is also expected to continue to increase slowly and by 1988 should represent a smaller share of total County employment. This does not mean that the federal influence will decrease, but instead suggests that employment in industries which serve the federal establishment (e.g., research and development, etc.) will probably increase.

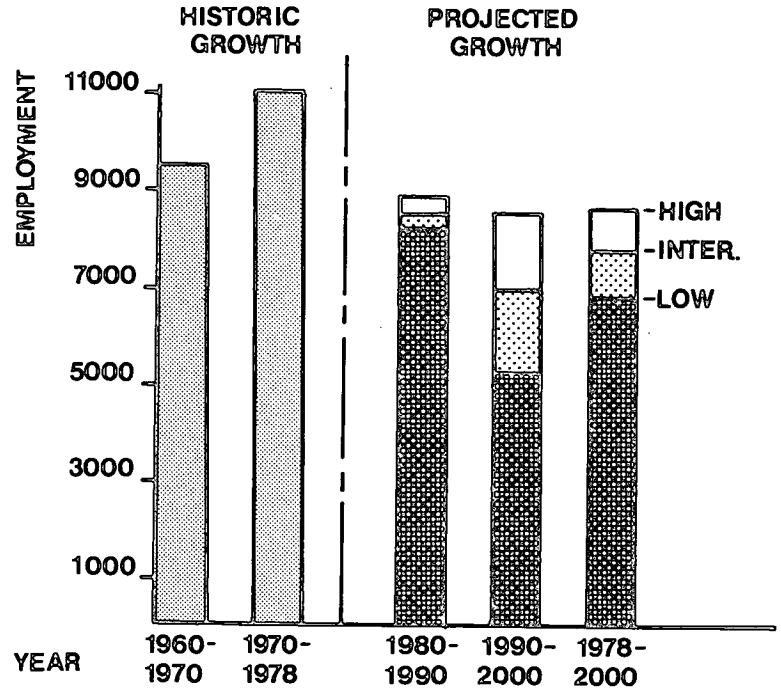
Over the next decade, employment is forecast to continue to increase at a more rapid rate than population. In the 1970-1977 period, this process resulted in an increase in the proportion of the working population, age 16 and over, of four percentage points (in 1970, 61 percent of the working age population were employed; by 1977, this percentage had increased to close to 65 percent. Furthermore, the percentage of the resident labor force employed in the County increased from 53 percent in 1970 to almost 58 percent in 1978. It is presumed that the projected growth in employment and population will have a comparable impact on the County's employment pattern in the future. Furthermore, the increased number of jobs will probably attract more commuters from adjoining jurisdictions.

Long term employment growth to the Year 2000 in the County is expected to outpace the Washington regional average. Between 1974 and the end of the century, gains ranging from the low projection of 78 percent to the high projection of almost 96 percent is foreseen, compared with 53 and 73 percent in the region. The core area is expected to have the lowest rate of growth (17 and 27 percent) over this time period, whereas the exurbs will probably show larger percentage gains from a smaller numerical base.

Assumptions made for the Round 2 Forecast of Montgomery County are as follows:

MONTGOMERY COUNTY
ANNUAL AVERAGE GROWTH

EMPLOYMENT



SOURCE: MONTGOMERY COUNTY PLANNING BOARD STAFF

COMPARISON OF ROUND 2 - INTERMEDIATE FORECASTS
WITH ROUND 1 FORECASTS FOR 1995
(Add 000 to numbers)

	HOUSEHOLDS				POPULATION				EMPLOYMENT			
	Round		Change from		Round		Change from		Round		Change from	
	2	1	Round 1	Percent	2	1	Round 1	Percent	2	1	Round 1	Percent
District of Columbia	295	319	-24	-7.5%	734	793	-59	-7.4%	690	798	-108	-13.5%
Arlington	94	108	-14	-13.0%	198	192	+6	+3.1%	195	196	-1	-0.5%
Alexandria	64	81	-17	-21.0%	136	160	-24	-15.0%	80	83	-3	-3.6%
CORE: Total	453	508	-55	-10.8	1,068	1,145	-77	-6.7%	965	1,077	-112	-10.4%
Montgomery	273	282	-9	-3.2%	747	758	-11	-1.5%	403	397	+6	+1.5%
Prince Georges	293	347	-54	-15.6%	822	1,028	-206	-20.0%	384	396	-12	-3.0%
Fairfax[1]	309	325	-16	-4.9%	900	970	-70	-7.2%	355	378	-23	-6.1%
SUBURBS: Total	875	954	-79	-8.3%	2,469	2,756	-287	-10.4%	1,141	1,171	-30	-2.6%
Loudoun	45	32	+13	+40.6%	138	102	+36	+35.3%	47	23	+24	+104.3%
Prince William[1]	84	65	+19	+29.2%	290	236	+54	+22.9%	74	71	+3	+4.2%
EXURBS: Total	129	97	+32	+33.0%	428	338	+90	+26.6%	121	94	+27	+28.7%
REGION: Total	1,457	1,558	-101	-6.5%	3,965	4,239	-274	-6.5%	2,227	2,342	-115	-4.9%

[1] Includes independent cities
SOURCE: COG Cooperative Forecasting. Prepared by Montgomery County Planning Board Staff.

- Pipeline

  Approximately 45,000 sewer commitments currently exist in the County. This information was a significant input to our short range forecasts through 1985.

- Sewer Constraints

  Sewer treatment capacity constraints would be removed gradually by 1985. The sewer envelope would retain its current basic shape.

- Zoning Constraints

  Current adopted master plans and existing zoning regulations were used to estimate the ultimate amount of growth which could be accommodated in Montgomery County.

- Past Trends

  The regional share model was used as a guide in developing the draft forecasts. This approach takes into account past trends and our short term future outlook. The extrapolation of these trends indicate that at Year 2000 Montgomery County will retain its current share of households in the Washington area suburban ring of approximately 31 percent.

- Household Size

  This was determined by the use of our demographic model. The model ages the population and projects future changes in average household size based on housing mix assumptions.

- Market Conditions

  The COG models provide a sufficiently accurate

MONTGOMERY COUNTY AT-PLACE EMPLOYMENT
BY INDUSTRY SECTOR: 1978-1988

	1978[1]		1988[2]		Growth Between 1978 and 1988	
	Number	Percent	Number	Percent	Number	Percent
Construction	24,000	8.9	28,000	8.0	4,000	4.9
Manufacturing	15,000	5.5	16,000	4.5	1,000	1.2
TCPU[3]	5,500	2.0	7,000	2.0	1,500	1.8
Wholesale Trade	7,000	2.6	8,500	2.4	1,500	1.8
Retail Trade	48,000	17.7	60,000	17.0	12,000	14.6
FIRE[4]	18,000	6.7	21,500	6.1	3,500	4.3
Services	68,000	25.1	107,000	30.3	39,000	47.6
Local & State Government	24,000	8.9	29,500	8.4	5,500	6.7
Federal Govt.	44,000	16.3	53,000	15.0	9,000	11.0
Self-Employed and Other[5]	17,000	6.3	22,000	6.3	5,000	6.1
TOTAL	270,500	100.0	352,500	100.0	82,000	100.0

1 Preliminary estimates: Montgomery County Planning Board staff.

2 Council of Governments Round II Cooperative Intermediate Forecast.

3 Transportation, Communication and Public Utilities.

4 Finance, Insurance and Real Estate.

5 Other employment includes agricultural services, mining and household workers.

Source: Montgomery County Planning Board staff with reference to County Business Patterns, National Capital Planning Commission data, and COG.

forecast of regional employment, population, and household growth. Therefore, the sum of the local forecasts should approximately equal the COG projections. The COG model framework forecasts a statistical range for the region's potential market growth rate.

- Public Policy Effects

The forecasts are policy qualified market trend projections. Currently the most significant public policy constraint on future development is zoning which serves to limit market potential to a specified amount. The market is assumed to be the determiner of growth given the constraints of the zoning envelope.

- Dwelling Unit Mix

The higher growth rate assumes a larger percentage of apartment construction--42 percent versus 37 percent for the low rate. Current vacancy rates would remain in the future.

- Basis for Low vs. High

The high is the greatest amount of growth which we foresee will occur in the future. Likewise, the low is the minimum growth which we foresee to occur. The high and low range was derived from a projection of Montgomery County's share of regional growth. The intermediate forecast represents our attempt to forecast a most likely level of growth. However, the range of uncertainty expands as the time horizon increases. By itself, the intermediate forecast is most useful for short term analysis of five to ten years. Longer range forecasts necessitate the use of the high/low range for risk assessment purposes.

The low growth rate amounts to an average annual construction rate of 2,500 units which is approximately the same as Montgomery County has experienced since 1975. The high growth rate assumes an annual construction rate of 5,200 units which is essentially the same as the County's average for the past ten years. The intermediate forecast is based upon a 4,200 per year average.

10 Year Forecast

Population

The intermediate population growth forecast for Montgomery County anticipates an increase of 78,000 people by 1988, for an annual average increase of almost 8,000. This compares with an annual average growth of 18,000 in the decade of the 1960's and 8,700 per year during the first seven years of the 1970's. Growth is not expected to be uniform over the entire period. Instead, an annual average growth of 5,500 persons is forecast by 1983, compared with 10,100 between 1983 and 1988.

Average Household Size

Average household size is expected to continue to decline, as young adults leave for college or to form single households, marriages are delayed and the number of divorces increases. These factors contribute to the decline in birth rates which peaked in the late 1950's and have been declining since then.

In 1977, the number of persons in each household averaged 2.93, by 1985 it is projected to decline to 2.76. This decline of almost 6 percent in average household size over the next eight years is equivalent to an annual population loss of residents in over 1,600 occupied homes. In other words, over 1,600 new occupied homes

POPULATION AND DWELLING UNIT FORECAST 1978-1988
Existing and Forecast Population and Housing Units in
Montgomery County by Policy Areas and Planning Areas
INTERMEDIATE GROWTH RATE

Policy Areas and Planning Areas	1978		Forecast 1983		Forecast Change 1978-1983		Forecast 1988		Forecast Change 1978-1988	
	POP.	DU	POP.	DU	POP.	DU	POP.	DU	POP.	DU
SILVER SPRING	59,000	25,847	61,100	25,997	2,100	150	64,700	27,547	5,700	1,700
PA 36 Silver Spring	32,600	15,406	35,000	15,506	2,400	100	38,600	17,006	6,000	1,600
37 Takoma Park	26,400	10,441	26,100	10,491	-300	50	26,100	10,541	-300	100
BETHESDA	86,700	33,232	87,800	35,032	1,100	1,800	94,700	36,882	8,000	3,650
PA 35 Bethesda	86,700	33,232	87,800	35,032	1,100	1,800	94,700	36,882	8,000	3,650
NORTH BETHESDA	79,000	26,410	80,000	28,410	1,000	2,000	83,700	30,910	4,700	4,500
PA 26 Rockville	46,000	15,191	46,000	15,991	0	800	46,200	16,891	200	1,700
30 N. Bethesda	33,000	11,219	34,000	12,419	1,000	1,200	37,500	14,019	4,500	2,800
KENSINGTON-WHEATON	153,800	51,401	151,700	53,601	-2,100	2,200	154,500	56,001	700	4,600
PA 27 Aspen Hill	44,500	14,248	44,300	15,748	-200	1,500	44,900	16,748	400	2,500
31 Wheaton	75,800	25,930	74,700	26,230	-1,100	300	75,600	27,030	-200	1,100
32 Kemp Mill	33,500	11,223	32,700	11,623	-800	400	34,000	12,223	500	1,000
I-270 CORRIDOR	69,700	22,981	84,700	28,981	15,000	6,000	100,500	36,181	30,800	13,200
PA 13 Clarksburg	2,100	610	2,100	660	0	50	2,400	760	300	150
19 Germantown	8,800	2,259	14,700	4,359	5,900	2,100	23,000	7,559	14,200	5,300
20&21 Gaithersburg	58,800	20,112	67,900	23,962	9,100	3,850	75,100	27,862	16,300	7,750
COLESVILLE	46,800	14,911	48,600	16,461	1,800	1,550	54,000	18,611	7,200	3,700
PA 28 Cloverly	10,500	3,003	10,800	3,253	300	250	11,600	3,653	1,100	650
33 White Oak	26,900	9,113	27,500	9,913	600	800	29,500	10,863	2,600	1,750
34 Fairland	9,400	2,795	10,300	3,295	900	500	12,900	4,095	3,500	1,300
POTOMAC	50,200	13,084	54,700	15,884	4,500	2,800	59,500	18,584	9,300	5,500
PA 24 Darnestown	4,000	1,112	4,800	1,512	800	400	6,000	1,912	2,000	800
25 Travilah	9,100	2,323	10,900	2,923	1,800	600	13,300	3,623	4,200	1,300
29 Potomac	37,100	9,649	39,000	11,449	1,900	1,800	40,200	13,049	3,100	3,400
OLNEY	20,600	5,458	22,000	6,558	1,400	1,100	25,100	7,558	4,500	2,100
PA 23 Olney	20,600	5,458	22,000	6,558	1,400	1,100	25,100	7,558	4,500	2,100
DAMASCUS	20,600	5,789	22,600	6,989	2,000	1,200	26,100	8,289	5,500	2,500
PA 10 Bennett	3,200	902	3,200	1,002	0	100	3,400	1,102	200	200
11 Damascus	4,500	1,283	4,900	1,533	400	250	5,200	1,633	700	350
14 Goshen	4,600	1,287	5,200	1,687	600	400	6,100	1,987	1,500	700
15 Patuxent	3,600	1,013	3,800	1,213	200	200	4,400	1,413	800	400
22 Rock Creek	4,700	1,304	5,500	1,554	800	250	7,000	2,154	2,300	850
POOLESVILLE	7,100	2,084	7,800	2,284	700	200	8,700	2,634	1,600	550
PA 12 Dickerson	1,300	371	1,450	431	150	60	1,600	481	300	110
16 Martinsburg	200	59	250	69	50	10	300	79	100	20
17 Poolesville	3,900	1,157	4,300	1,257	400	100	4,950	1,507	1,050	350
18 Lower Seneca	1,700	497	1,800	527	100	30	1,850	567	150	70
TOTAL COUNTY	593,500	201,197	621,000	220,197	27,500	19,000	671,500	243,197	78,000	42,000

Source: 1978 Housing Units--Estimated by MCPB staff from data compiled from records of the Office of Supervisor of Assessments, Montgomery County.
1978 Population--Estimated by MCPB staff from 1977 Census Update and Administrative records.
1983 and 1988 Population and Housing Units--Intermediate Rate, Montgomery County Planning Board.
Note: All numbers are for January 1st.

HOUSEHOLD HEADS, BY AGE:
Montgomery County

Age	Year 1960[a/]	1970[a/]	1974[b/]	1977[b/]	1987[c/]
Under 30	9,718	25,743	31,000	30,600	28,300
30-44	41,988	51,639	58,700	66,100	84,900
45-64	31,650	62,354	73,400	75,200	89,700
65 years +	9,077	16,937	23,600	24,300	34,200
Total	92,433	156,673	186,700	196,200	237,100

SOURCE:

a/ 1960 and 1970: U.S. Bureau of the Census.

b/ 1974 and 1977: Montgomery County Planning Board Census Update Surveys. Data rounded to nearest 100.

c/ 1987: Montgomery County Planning Board staff Demographic Model Projections. Data rounded to nearest 100.

are needed, annually, to offset the population loss due solely to the decline in household size in the existing housing stock.

Household Heads

The number of household heads is expected to increase by 41,000; to reach a total of over 237,000 by 1987. Increases in household heads are anticipated in all age groups, except for those under age 30. This group has remained fairly stable or declined slightly in absolute numbers since 1974, possibly due to a combination of such factors as the crimp in housing activities and the shortage of affordable homes available to them, and (by 1987) the end of the post war era of the "baby boom" thereby reducing their absolute numbers. In 1977, this group was almost 17 percent of the 196,200 household heads, by 1987 it is estimated that they will be only 12 percent of all household heads.

The number of elderly heads are expected to increase by "only" 10,000, however, this is an increase of 40 percent over the 1977 estimate of 24,300. This represent the largest relative increase in households heads for any of the age categories. Elderly household heads, which, in 1977 were 12 percent of all households, are forecast to increase to 14 percent by 1987.

Significant increases are foreseen in the number of heads in the middle age groups. Three out of every four household heads in 1987 are likely to be between the age of 30 and 64. They typically are in their prime working years with a greater potential for higher earnings. If, as expected, they will have fewer children, a change in their housing preference could have a significant impact on the housing market.

Aging of the Population

The average age of County residents is projected to

FORECAST OF POPULATION*
BY AGE: 1960-1988
Montgomery County

Age Groups	1960		1970		1977		1983		1988	
	Number	Percent	Number	Percent	Number[a/]	Percent	Number[a/]	Percent	Number[a/]	Percent
0- 4	42,299	12.4	43,074	8.2	39,300	6.7	38,000	6.1	41,800	6.2
5-14	79,701	23.4	112,707	21.6	99,600	17.1	92,500	14.9	96,600	14.4
15-24	36,496	10.7	84,387	16.1	100,700	17.2	105,500	17.0	107,900	16.1
25-34	45,128	13.2	69,402	13.3	96,800	16.6	103,900	16.7	114,500	17.0
35-44	58,623	17.2	69,943	13.4	75,800	13.0	91,000	14.7	101,800	15.2
45-64	60,718	17.8	110,677	21.2	129,200	22.1	138,600	22.3	149,100	22.2
65 +	17,963	5.3	32,619	6.2	42,600	7.3	51,500	8.3	59,800	8.9
All Ages	340,928	100.0	522,809	100.0	584,000	100.0	621,000	100.0	671,500	100.0
Median Age	28.3		27.9		30.9		32.1		34.5	

a/ Figures rounded to nearest 100.
* Intermediate Growth Forecast.

SOURCE:
1960-1970: U.S. Bureau of the Census, Census of Population.
1977: Montgomery County Planning Board, 1977 Census Update Survey.
1983-1988: Montgomery County Planning Board, Demographic Model Forecast by staff.

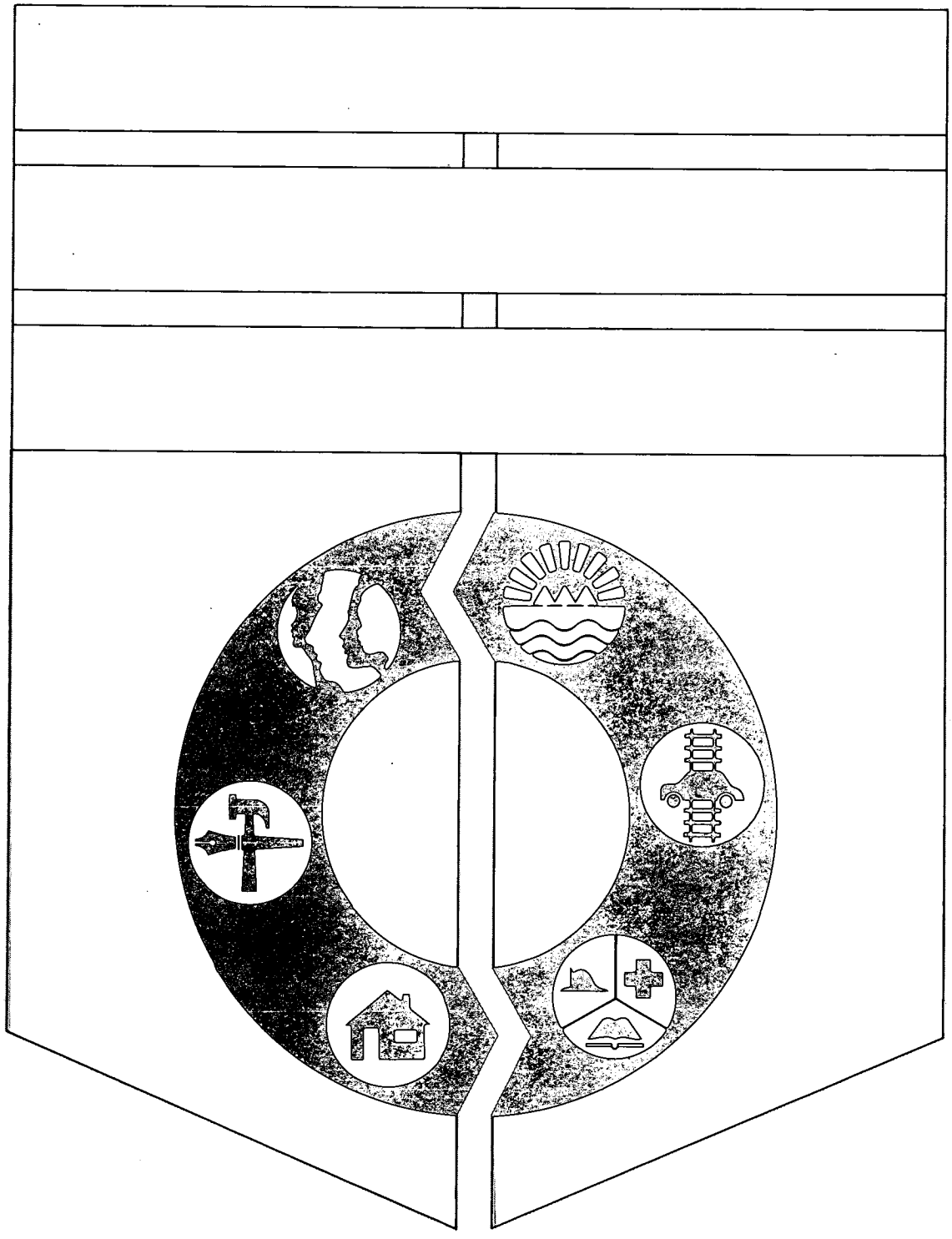
Note: School Enrollment Forecasts are prepared by Montgomery County Public Schools and should not be interpolated from this table.

continue to rise over the next decade due, in part, to the relative decline in the population under 15 years of age. In 1977, this group numbered slightly under 139,000, and represented 23.8 percent of the total population; by 1988 their number is expected to remain approximately the same but will represent only 21 percent of the 1988 population. The relative decline of this group, coupled with increases in other age groups leads to an increase in the median age of the population of 1.9 years, from 30.9 in 1977, to 32.8 in 1988. In 1970, half of the population was under 27.9 years of age; the median age has been rising since then.

It is interesting to note that the number of people age 25-34 is anticipated to increase by about 18,000 over this time period. This group is at what is commonly considered the normal age of forming households, raising families, and entering the housing market for the first time. If past history persists, they will seek affordable single-family homes or townhouses. The number of people in the oldest age category (65 years and older) will increase by 17,000, and by 1988 will represent almost 9 percent of the population, an increase of 1.6 percent over the 7.3 percent of 1977. Since most elderly households consist of only one or two persons, the growing size of this group will contribute to the falling average household size phenomenon. This group is expected to increase in size well beyond 1988 unless offset by mass movements out of the area to the Sun Belt or other areas. Their mobility may be enhanced by the recently enacted capital gains tax provision which shelters the profits (up to $100,000) from the sale of their homes. If this occurs, it may afford opportunities for housing for younger households and therefore may affect the demographic characteristics of the County.

Population and Dwelling Unit Increase

It should be understood that the forecast of an average annual increase in population of 7,800 between 1978 and 1988 is a net increase and represents the changes occurring in the population residing in the existing stock of houses in addition to those moving into newly constructed dwelling units.



Chapter Four

Fiscal

FISCAL 4

Summary

- *The fiscal impact analysis of anticipated growth in the County concludes that dollar surpluses will be generated from each of the three forecasts. These surpluses measure the extent to which incremental revenues exceed incremental costs of only new development and do not reflect the County budget total in any given year.*

- *The surplus, however, is not large enough to make a significant contribution toward lowering the County's tax rate. The impact of growth on the budget can be considered essentially neutral.*

- *Underlying these findings are major assumptions of growth, cost and revenue as described in this report. The computerized model which generated these findings is extremely flexible and can be easily altered to test other possible growth scenarios by varying the quantity and locations of future growth or by changing the value of any of the individual factors used. (See Major Assumptions section.) A deeper understanding of the complex relationship between land use and its fiscal implications emerges from the testing of various alternative growth premises.*

An Overview

Development can be viewed in various ways. It can advance or diminish County housing policy, economic development policy, the County General Plan or specific Master Plan goals. Growth may also be viewed through its impact on the County budget. Since almost all revenues and expenditures are related to land use, fiscal impact can be explicitly taken into account, when land use policy decisions are made.

The budget process assures that fiscal balance occurs at the County-wide level, while subareas may have either deficits or surpluses. Changes in land use policy (zoning, master plans, staging plans, etc.) have the potential of changing the balance in a positive way--increasing revenues relative to expenditures, or in a negative way--increasing expenditures relative to revenues. Variations among subareas can be traced back to differences in population characteristics, housing types, and employment levels. Population characteristics determine the demand for education and other services. Housing values directly affect the property tax yield and indirectly affect the income tax, since housing values and household incomes are, on the average, closely related. Jobs create more tax revenue than they demand in public service and, therefore, have a positive fiscal impact on those subareas where they are located. Extremely high income areas serve to compensate for the less wealthy areas. From the viewpoint of the general welfare, and the tax rate impact on the remainder of the County, it is the net County-wide economic impact which is the focus of prime concern. Any substantial shift of house values caused by housing policy or market considerations will materially change subarea conclusions.

As part of the Staging Plan Study, the Montgomery County Fiscal Model was adjusted to measure only the incremental impact of alternative growth scenarios. The result is summarized as a County-wide surplus or deficit. The 1975 Growth Policy Report used a more complex version of the model which attempted to measure the combined future effect of existing and forecast development. Analysis of the type prepared in 1975 is useful to fiscal planning, but it tends to mask the true impact of alternative growth and land use scenarios, since surpluses or deficits which are produced by existing development are combined with the marginal impact of growth. For example, a combined fiscal analysis would tend to understate the true educational costs of new development by adding the number of students generated by new housing to the enrollment declines projected for the existing housing stock. The declining average number of people per household in the County and resultant decline in the number of school age children per dwelling has been a dramatic event in terms of the County's financial responsibilities. The Board of Education's budget comprises approximately half of all County expenditures. In the last several years, 21 schools have been closed because of declining enrollments. Assumptions concerning future school age population have enormous impact on the fiscal analysis.

In general, our past fiscal prosperity has been based upon the County's ability to attract high quality residential development. At present more than 83 percent of all County revenues are derived from residents and residential property owners. County residents are highly educated with above average incomes. County businesses are important for their positive fiscal impact, but have less budget significance than the County's resident population.

Fiscal Impact of the Forecasts

The mix of development included in the new forecasts will generate a small to moderate fiscal surplus to the

County at current tax and expenditure rates. The net result of the budget impact of three alternative forecasts for five year intervals from January 1979 through 1995 is shown in Table 4.1. The 1980 section shows the impact of one year's growth while the 1985, 1990, and 1995 figures show 6, 11, and 16 years growth, respectively. The right-hand column shows the annual surplus from the cumulative growth. The surplus varies from $2.2 million for one year's low growth to $34.7 million for 16 years high growth.

Commercial and industrial development to accommodate the 126,000 employees of the 1995 intermediate forecast generates about 10 percent of the 1995 surplus. This indicates that, although commercial and industrial property almost always yields a surplus and is valuable in providing balance in the tax base, it cannot be counted on to carry a large burden from deficit-generating residential property.

Residential property, as a whole, generates a healthy surplus. In general, high value single-family dwellings, high value rental apartments, and all condominiums, yield surpluses while medium and low value single-family units and rental units yield deficits.

The following Table (4.2) shows major categories of revenues and expenditures from business and residential development using the 1995 budget from the intermediate forecast as an example. These data are summarized from more detailed printouts generated by the fiscal model.

The model uses total County population, number of single-family and multi-family dwelling units from twelve areas and number of employees from six areas as demand bases. These demand generators are multiplied by a number of cost and revenue factors in each budget subsystem to generate the total fiscal result from the

Table 4.1

SURPLUSES FROM ALTERNATIVE FORECASTS IN FISCAL MODEL

Forecast	Cumulative[1] Population in New Dwelling Units	Cumulative Dwelling Unit Increment	Cumulative Employment Increment	Annual Surplus Generated in Last Year of Period (Millions of 1978 $)
		1979-1980		
Low	8,000	2,833	8,500	$ 2.22
Intermediate	11,000	3,333	8,500	2.15
High	13,800	4,670	8,500	3.01
		1979-1985		
Low	50,000	17,833	48,000	$ 3.25
Intermediate	70,500	25,333	48,550	5.65
High	107,300	39,670	54,000	7.49
		1979-1990		
Low	88,100	32,833	90,000	$ 9.55
Intermediate	131,100	48,333	93,650	12.96
High	182,400	64,670	97,900	17.27
		1979-1995		
Low	115,300	42,833	111,500	$16.99
Intermediate	189,800	71,333	125,650	27.84
High	242,600	89,920	134,500	33.29

[1] Population in new dwelling units (excluding those in group quarters) is calculated by taking the forecasted total population and subtracting the population that would occur if no new dwelling units were constructed. Since population in existing dwellings is declining, the population in new dwelling units is greater than the change in population over the same period of time. If no new dwelling units were built, the total population in existing units is projected by the Demographic Model to decline by 45,800 between 1979 and 1995. Since total population is forecast to grow by 144,000 during this period, the population in new dwelling units is calculated to be 144,000 + 45,800 = 189,800.

Source: Montgomery County Planning Board staff.

Table 4.2

1995 BUDGET FOR INTERMEDIATE GROWTH FORECAST

REVENUES IN THOUSANDS OF 1978 DOLLARS

	From Residential	Percent	From Business	Percent	Total	Percent
Property Tax	94,256	86%	15,305	14%	109,561	68%
Income Tax	32,239	100%	-	-	32,239	20%
Transfer Tax	9,201	94%	577	6%	9,778	6%
Energy & Telephone Tax	2,120	48%	2,276	52%	4,396	2.7%
Other Taxes	3,510	64%	1,986	36%	5,496	3.3%
Total	141,326	88%	20,144	12%	161,470	100.0%
EXPENDITURES (NET OF FEES AND GRANTS)						
Education	77,722	100%	-	-	77,722	59%
Public Safety	10,794	61%	6,775	39%	17,569	13%
Other Community	15,433	75%	5,090	25%	20,523	15%
Environment	8,803	95%	438	5%	9,241	7%
Transportation	3,476	41%	5,101	59%	8,577	6%
Total	116,228	87%	17,404	13%	133,632	100%
SURPLUS	25,098		2,740		27,838	

Source: Montgomery County Planning Board staff.

development mix being tested. Geographic sensitivity is included in the form of variable by having different school yields and household sizes which affect the expenditure calculations, as well as property values and income tax yields in the revenue calculations.

Major Assumptions

The major assumptions used in preparing the data and the fiscal model parameters are:

1. In general, new development has the same characteristics as existing development of the same type, e.g., single-family, multi-family or employment, in the same area.

2. Future multi-family construction will be 75 percent condominium and 25 percent rental.

3. Rental apartments and condominium apartments share the same characteristics other than assessed value and turnover rate.

4. The costs of delivering public services do not vary significantly by subarea within the urbanized area of the County.

5. The costs of providing service to a new dwelling, person, or job will remain at the FY 79 level in constant 1978 dollars. That is, a constant level of service will be maintained as measured in real dollars per person, household, or job.

6. Programs will expand no faster than the growth of population, households, and jobs.

7. School yields are constant over time.

8. Per household costs do vary by geographic subarea because of varying household sizes and school yields, although costs per person or student do not vary.

9. The present tax rate of $3.52 is used in deriving fiscal impacts.

10. Single-family units (including townhouses) appreciate at 2.5 percent per year in 1978 dollars; other units do not appreciate or depreciate in real dollars.

11. Only 20 percent of new rental apartments and business space is subject to transfer tax.

12. Average sales turnover rates are assumed to be once every 10 years for single-family homes and condominiums, once every 20 years for rental apartments and business property.

13. Debt Service expenses for programmed capital improvements are divided between existing development and future growth based on information in the FY 1979-1984 CIP.

    a. Expenditures for renovation, relocation, replacement, and upgrading of existing facilities, without any increase in capacity, are allocated to existing development.

    b. Facilities which are to serve the entire County, but which appear to have excess capacity, are assumed to be built to adequately serve the projected 1990 County population; this resulted in an allocation of 85 percent to existing growth (based on 1978 population) and 15 percent to growth (based on projected 1978-1990 population increase).

    c. Capital improvements serving small areas are allocated according to the characteristics of the area served: fully developed (100 percent to existing); partially developed (50:50); and predominantly rural or relatively undeveloped (100 percent to growth).

    d. Storm drainage and storm water management projects in the CIP are assumed to be for correcting existing problems (past development) rather than anticipated new development, unless otherwise stated.

    e. Although proposed stream valley, regional, and conservation park acquisitions represent long-range policy somewhat independent of new development, the pace of acquisition is likely to be affected by the pace of growth. Faster growth places conservation areas in jeopardy sooner and may tend to raise land costs faster; but new growth also generates additional revenues (at constant tax rates) for park acquisition and development. Therefore, it is assumed that annual park debt service costs would remain a constant percentage of the park operating budget (about 30 percent).

Our finding that the mix of development included in the forecasts is fiscally balanced, derives from the above assumptions. The conclusion assumes that the current level of service, as expressed in constant dollars per capita, household, or job will remain unchanged. This implies no expansion in programs above the rate of new development.

Land Use and the Budget

In fiscal terms, a new dwelling unit establishes a complex set of revenue and expenditure relationships. To the extent that the revenues and expenditures are equal, the fiscal effect of a dwelling unit is negligible. When revenues exceed expenditures, the surplus can be used to lower the tax burden on all other residents or increase service levels. When expenditures exceed revenues, the deficit must be made up by increasing the tax burden on the population in general or decreasing service levels.

Revenues from a dwelling unit are generated from the value of the home and the income of its occupants. The homeowner pays property tax, consistent with the assessed value of the dwelling unit. The household pays income tax. Some of the goods and services purchased generate County tax revenue or service fees. On the other side, the new residents will impose expenditures on the County. Some members of the household may be either public school or Montgomery College students. The home will be protected by policemen and firemen. They require adequate transportation access to other parts of the County and the region.

The greatest variation in the fiscal equation for different subareas of the County occurs on the revenue side of the equation. With similar structure types, dwelling unit assessment can widely vary. The range of revenue generation is increased, because higher incomes accompany increases in the value of new dwelling units. This primarily results from the fact that there is a very high rate of housing turnover in Montgomery County due to the mobility of its population. Our most recent Census Update Survey indicates that over 50 percent of all housing is occupied by a new household every five years. While this observation is useful for statistical and analytical purposes, there are, of course, exceptions to the average.

Policy Uses of Fiscal Impact Analysis

The fiscal impact of a land use plan should be only one of the factors considered in its design and implementation. Other important factors which may be contrary to a policy of short-term maximization of net public revenues include: provision of housing opportunities for low and moderate income residents, prevention of intolerable congestion by down zoning of central business districts, and provision of the high quality of public services and amenities now enjoyed in Montgomery County. These factors may have a short-term negative fiscal impact, but they help create a quality environment and attract high-value residential development, the basis of Montgomery County's tax base.

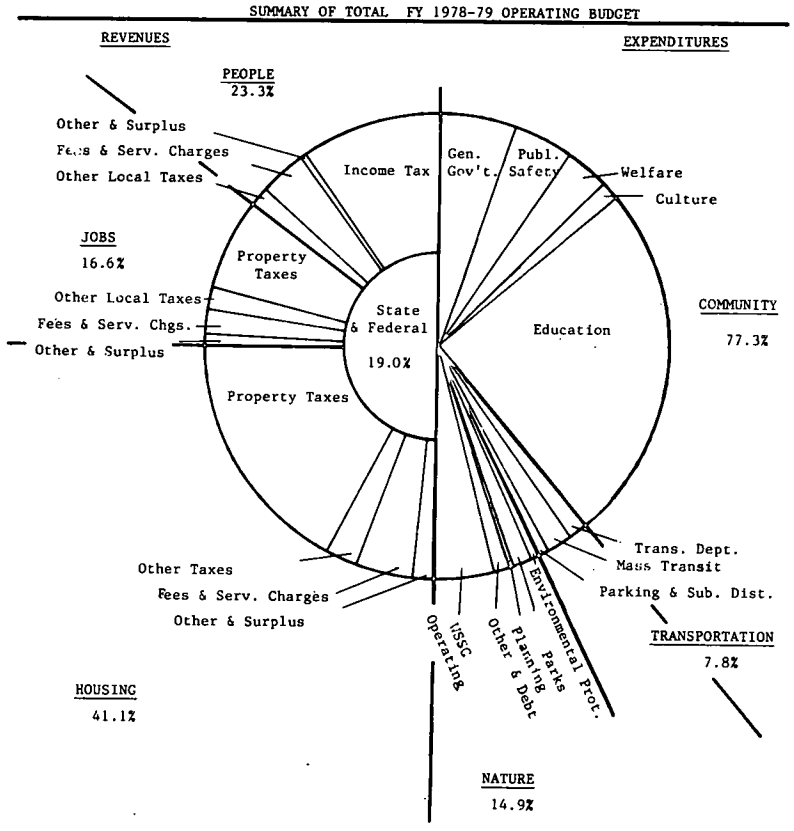
CIP Conclusions

The growth-related road improvements in the Capital Improvements Program are an example of expenditures with a positive fiscal impact. The County expenditures are more than offset by the increased revenues forthcoming from new growth. The bonded debt can be handled easily within the County's bonding limits. Much of the expenditure is paid by state and federal grants. The recommended road program can accommodate the growth assumed in the intermediate forecast. Reductions in the program would likely reduce the staging thresholds, forecast, and fiscal surplus from growth.

An Analysis of the Montgomery County Budget for Fiscal Year 1979 by the Urban System Elements

In analyzing the cost of local government for Montgomery County residents, it is important to include the

Figure 4.1



Source: Montgomery County Planning Board staff.

Table 4.3

SUMMARY OF FY 1979 OPERATING BUDGETS

	Amount	Percent Distribution
PEOPLE		
Income Tax	$ 99,500,000	15.9
Other Local Taxes	3,330,000	.5
Fees & Service Charges	31,066,000	4.9
Other & Surplus	12,323,000	2.0
Subtotal	146,219,000	23.3
JOBS		
Property Taxes	65,317,000	10.4
Other Local Taxes	11,431,000	1.8
Fees & Service Charges	18,124,000	2.9
Other & Surplus	9,458,000	1.5
Subtotal	104,330,000	16.6
HOUSING		
Property Taxes	173,944,000	27.7
Other Local Taxes	23,210,000	3.7
Fees & Service Charges	44,213,000	7.1
Other & Surplus	16,479,000	2.6
Subtotal	257,846,000	41.1
STATE & FEDERAL AID	119,519,000	19.0
COUNTY TOTAL	$627,914,000	100.0
COMMUNITY		
General Government	$ 67,768,000	10.8
Public Safety	51,768,000	8.3
Welfare	39,586,000	6.3
Culture	12,543,000	2.0
Education	313,544,000	49.9
Subtotal	485,209,000	77.3
TRANSPORTATION		
Transportation Dept.	19,494,000	3.1
Mass Transit	22,737,000	3.6
Parking & Suburban Dists.	6,681,000	1.1
Subtotal	48,912,000	7.8
NATURE		
Environmental Protection	4,050,000	.6
Parks	19,606,000	3.1
Planning	3,609,000	.6
Other & Debt Service	12,093,000	1.9
WSSC Operating	54,435,000	8.7
Subtotal	93,793,000	14.9
TOTAL	$627,914,000	100.0

Source: Montgomery County Planning Board staff.

total costs for all urban systems: Community, Transportation, and Nature. Thus, in addition to the County's General Fund Budget, all special districts, commissions, and boards are also examined. For instance, Montgomery County's shares of The Maryland-National Capital Park and Planning Commission (M-NCPPC) and the Washington Suburban Sanitary Commission (WSSC) are included.

Expenditures (See Figure 4.1)

The total budget for the Montgomery County General Fund, special funds, and independent commissions will amount to about $628 million in FY 1979. The overwhelming majority of these expenditures (77 percent) go to the Community System. Education accounts for 50 percent of the total budget. Culture (Libraries and Recreation) accounts for only 2 percent of total expenditures.

Less than 8 percent of the operating budget is consumed by Transportation. Public Transit takes the largest share, followed by the County Department of Transportation.

Nature accounts for almost 15 percent of the budget. Parks (M-NCPPC, plus contributions for other parks) is 3.1 percent of the total and the M-NCPPC Planning activities account for 0.6 percent.

Montgomery County's share of the Washington Suburban Sanitary Commission budget (WSSC) equals almost 9 percent of all expenditures; this is more than is spent on Public Safety (Police, Fire and Rescue). However, most WSSC revenues are from user charges, while most Public Safety expenditures are funded through taxes.

Revenues

Revenues are derived from People, Jobs, and Housing, as well as from State and Federal Government transfers. Property taxes (real and personal) account for over 38 percent of total local government revenues. Property taxes derive from both Housing (28 percent of total revenues) and Jobs (10 percent).

The second major source of revenues is State and Federal Aid--19 percent of total revenues. These funds tend to be oriented to People, with education accounting for almost half of these transfers.

Local income taxes are paid only by residents (People) and account for almost 16 percent of total revenues. This is almost equal to the total revenues from Jobs.

User Fees and Service Charges only account for 15 percent of the budget. These revenues are directly related to consumption, and include WSSC fees, solid waste collection and disposal fees, parking lot charges, school lunch fees, recreation fees, and publication sales.

Miscellaneous revenues include interest on investments and forfeitures and account for 2.7 percent of total revenues. Surpluses from Fiscal Year 1978 should supply over $21 million or 3.4 percent of total revenues.

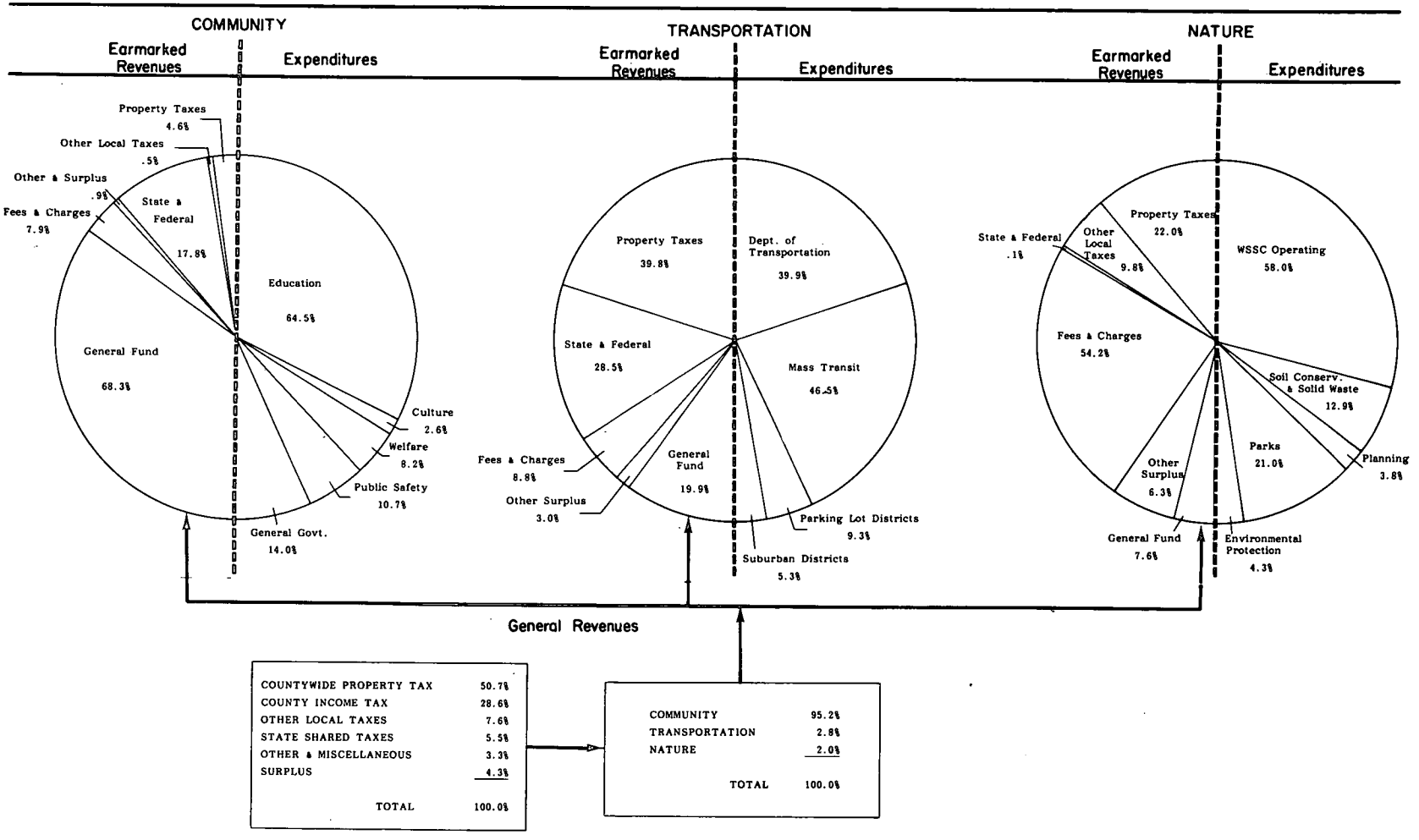
Montgomery County revenues and expenditures are summarized in Table 4.3.

Approximately $279,458,000 or 45 percent of the total revenues are earmarked for particular uses. The remaining 55 percent, consisting primarily of the Countywide General Property Tax and Income Tax, goes into the General Fund from which monies are transferred as needed to balance each system's budget.

Figure 4.2

Summary of Revenues and Expenditures by Major System.

Fiscal Year 1979 Operating Budgets

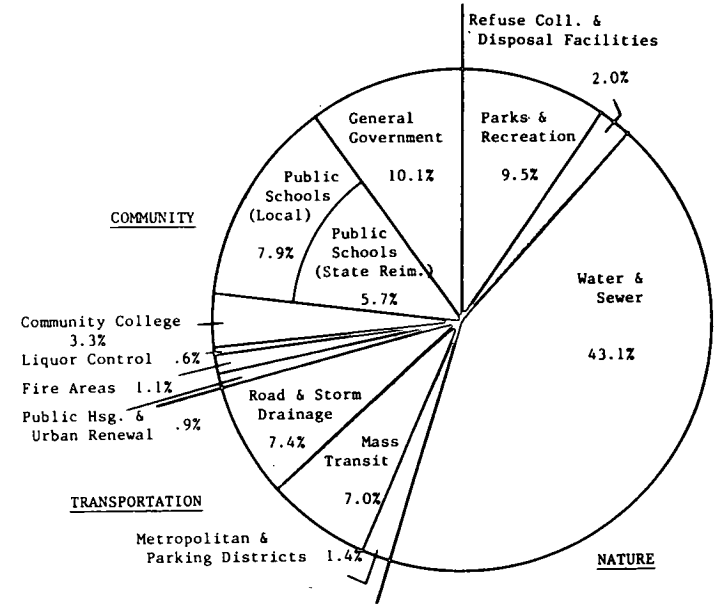


Source: Montgomery County Planning Board staff.

Figure 4.3

SUMMARY OF OUTSTANDING LONG-TERM DEBT
AS OF JUNE 30, 1978

		Amount	Distribution
COMMUNITY			
General Government		$ 65,452,445	10.1%
Public Schools			
Local		51,168,290	7.9
State Reimburs.		36,805,000	5.7
Community College		21,551,710	3.3
Liquor Control		3,953,608	.6
Fire Areas		6,904,207	1.1
Public Housing & Urban Renewal		5,640,000	.9
		(191,475,260)	(29.6)
TRANSPORTATION			
Road & Storm Drainage		$ 47,940,894	7.4%
Mass Transit		45,270,000	7.0
Metropolitan & Parking Districts		9,349,000	1.4
		(102,559,894)	(15.8)
NATURE			
Parks & Recreation			
County	$24,705,689		
M-NCPPC	36,675,000	$ 61,380,689	9.5%
Refuse Collection & Disposal Facilities		12,614,157	2.0
Water & Sewer			
County	$ 325,000		
WSSC	278,375,400	278,700,400	43.1
		(316,020,246)	(54.6)
	TOTAL	$646,730,400	100.0%



Source: Montgomery County Planning Board staff.

Community System

Almost two-thirds of the Community System expenditures go to Education. The remainder is divided among General Government (14 percent), Public Safety (10.7 percent), Welfare (8.2 percent), and Culture (2.6 percent).

On the revenue side, 4.6 percent comes directly from Property Taxes to fund Community expenses. Other Local Taxes account for another .5 percent. State and Federal Aid (primarily Education) accounts for an additional 17.8 percent, with Fees and Charges, Miscellaneous, and the Previous Year's Surplus accounting for 8.8 percent. Transfers from the General Fund make up the remaining 68.3 percent.

Transportation System

Mass Transit (Metro-rail and bus service) accounts for 46.5 percent of the Transportation System expenditures. The County's Department of Transportation consumes almost 40 percent. Parking Lot Districts require 9.3 percent of the Transportation budget, but actually generate an overall surplus. The remainder of expenditures (5.3 percent) goes into the Suburban District fund.

Revenues for the Transportation System come primarily from property taxes (almost 40 percent). State and Federal funds account for over one-fourth. In addition to subsidies to the operating budget, it should be pointed out that federal and state sources heavily subsidize transportation capital improvements, resulting in lower debt service charges in the operating budget. Fees and Charges, for transit riders and parking district patrons, generate about 8.8 percent of total revenues. Miscellaneous revenues and the Previous Year's Surplus only generate 3 percent. Transfers from the General Fund support almost 20 percent of the Transportation System budget.

Nature System

The largest subsystem under Nature is Montgomery County's share of the WSSC Operating Budget, which accounts for 58 percent. Solid waste collection and disposal take almost 13 percent of expenditures. Environmental Protection utilizes 4.3 percent of the Nature budget. The County's various park systems take 21 percent of expenditures, while M-NCPPC's planning operation requires 3.8 percent.

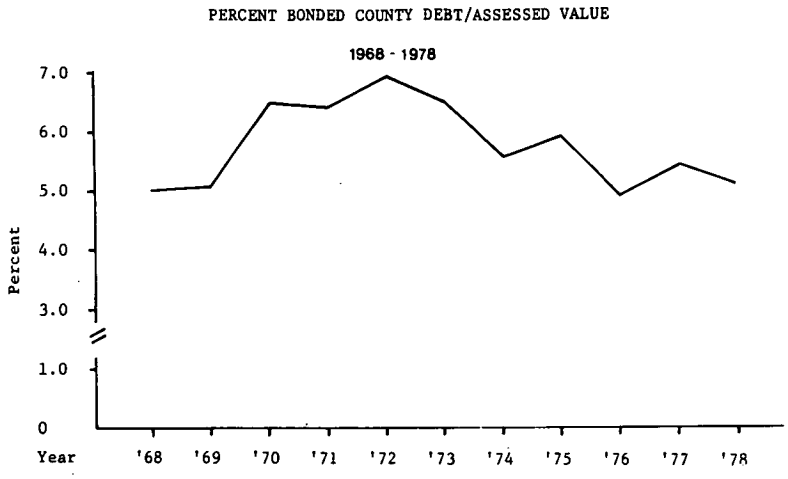
The Nature System utilizes fees and charges to a much greater extent than other systems to cover expenses; over 54 percent of the budget derives from such fees, and includes WSSC water and sewer charges, solid waste collection and disposal fees, and park fees. Property taxes account for less than one-fourth of the Nature budget. Other local taxes (primarily WSSC's front-foot charges) account for another 9.8 percent. Miscellaneous and the Previous Year's Surplus provide another 6.3 percent. State and federal grants only provide 0.1 percent of total revenues to the Nature operating budget. However, it should be noted that the WSSC Capital Budget is very heavily subsidized by the Federal Government, resulting in somewhat lower debt service charges in the Operating Budget. General Fund transfers account for 7.6 percent of the money spent on Nature.

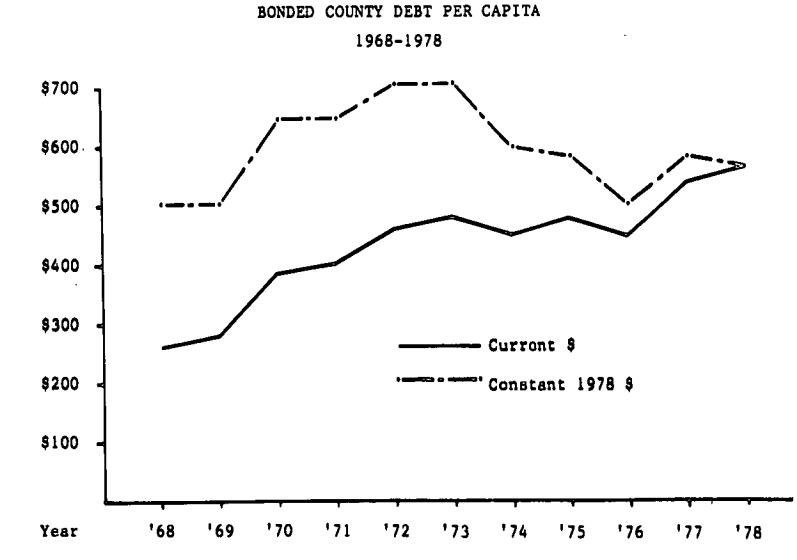
The above information is illustrated in Figure 4.2

Outstanding Debt

Long-term debt outstanding as of June 30, 1978 amounted to almost $650 million, including Montgomery County's share of WSSC and M-NCPPC debt. The Community System accounted for almost 30 percent of this debt, including General Government (10 percent). Education totaled 17 percent of the outstanding debt;

Figure 4.4





Source: Montgomery County Planning Board staff.

3.3 percent was for the Community College. Public Schools had another 13.6 percent of the outstanding debt but 5.7 percent will eventually be reimbursed by the State. (See Figure 4.3.)

Transportation accounted for about 16 percent of the outstanding debt reflecting its capital-intensive nature; (Transportation took only 7.8 percent of the operating budget). Road and Storm Drainage Improvements accounted for 7.4 percent of the debt, Mass Transit for 7.0 percent, and the Metropolitan and Parking Districts for 1.4 percent. The Metropolitan District debt will be retired in FY 1979.

The Nature System generated 54.6 percent of the outstanding debt. The Nature portion of the operating budget is 14.9 percent, indicating that the Park, Water and Sewer systems also are very capital-intensive.

It is County policy that the County's General Obligation bonded debt, at any one time, should not exceed 3.5 percent of the market value of taxable property; this works out to about 7.5 percent of assessed value. State law limits debt to 15 percent of assessed value. Recently, as indicated in Figure 4.4, this ratio has tended to decline, indicating that the level of improvements funded in the late 1960's and early 1970's has slowed down, and that assessed values of property have recently risen at a faster rate than capital improvements. (Figure 4.4 excludes M-NCPPC and WSSC debt.)

Bonded debt per capita has tended to rise over the past decade (Figure 4.4). However, when the effects of inflation are subtracted, per-capita debt has tended to decline during the later part of the 1970's.

Operating Versus Capital Costs

Any capital investment in infrastructure requires annual

operating costs in future years to cover maintenance, staffing, and debt service. The relationship between maintenance and staffing costs, and capital investment for various governmental services is shown in Figure 4.5. Debt service is excluded as it declines each year; for instance, a series of bonds issued for twenty years and yielding interest of 6 percent will require a debt service cost of approximately 11 percent of the issue in the first year, declining to about 5.3 percent in the twentieth year.

The ratio of non-debt service operating cost ranges from a fraction of a percent for highways to over 40 percent for an elementary school. These figures reflect the capital-intensive nature of Transportation and the more labor-intensive nature of Education. One million dollars invested in transportation improvements will result in annual operating costs of $300 to $450. A one million dollar investment in a neighborhood park will increase the operating budget by about $99,000. (These figures exclude debt service.) On the other hand, each $401,000 in annual elementary school services will require a one million dollar capital investment to house these activities.

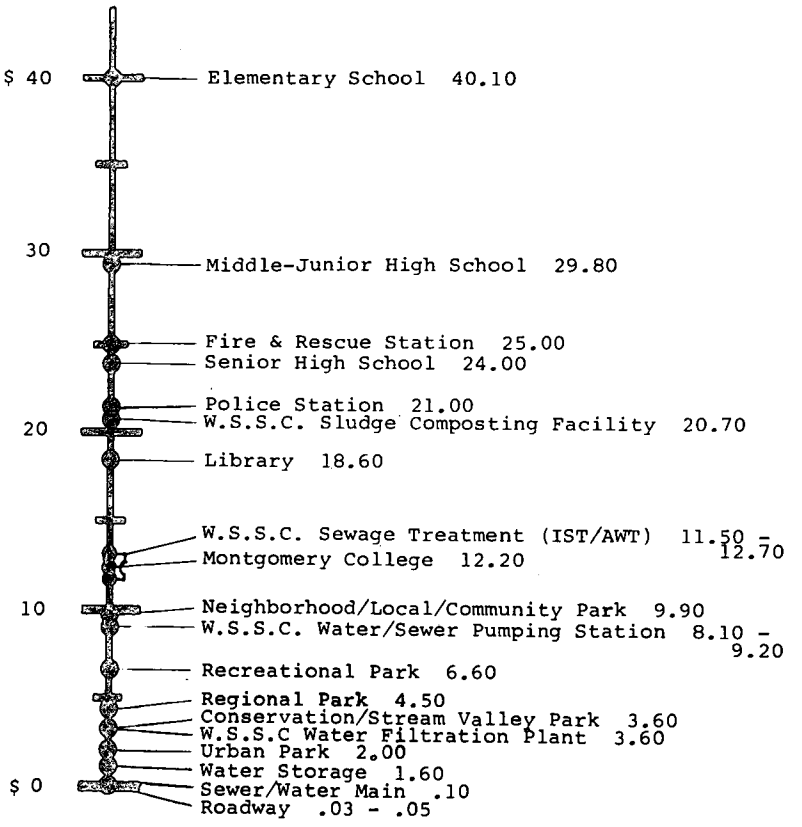
In the Park Subsystem, Neighborhood, Local and Community Parks have relatively high operating costs due to the greater maintenance and greater use of such parks by citizens. Urban Parks tend to have very high capital costs, due to the higher costs of land in urban areas, and the greater facilities and landscaping usually provided in such parks.

In the Education Subsystem, instruction becomes more capital-intensive as one moves from elementary schools through high schools, to the Community College.

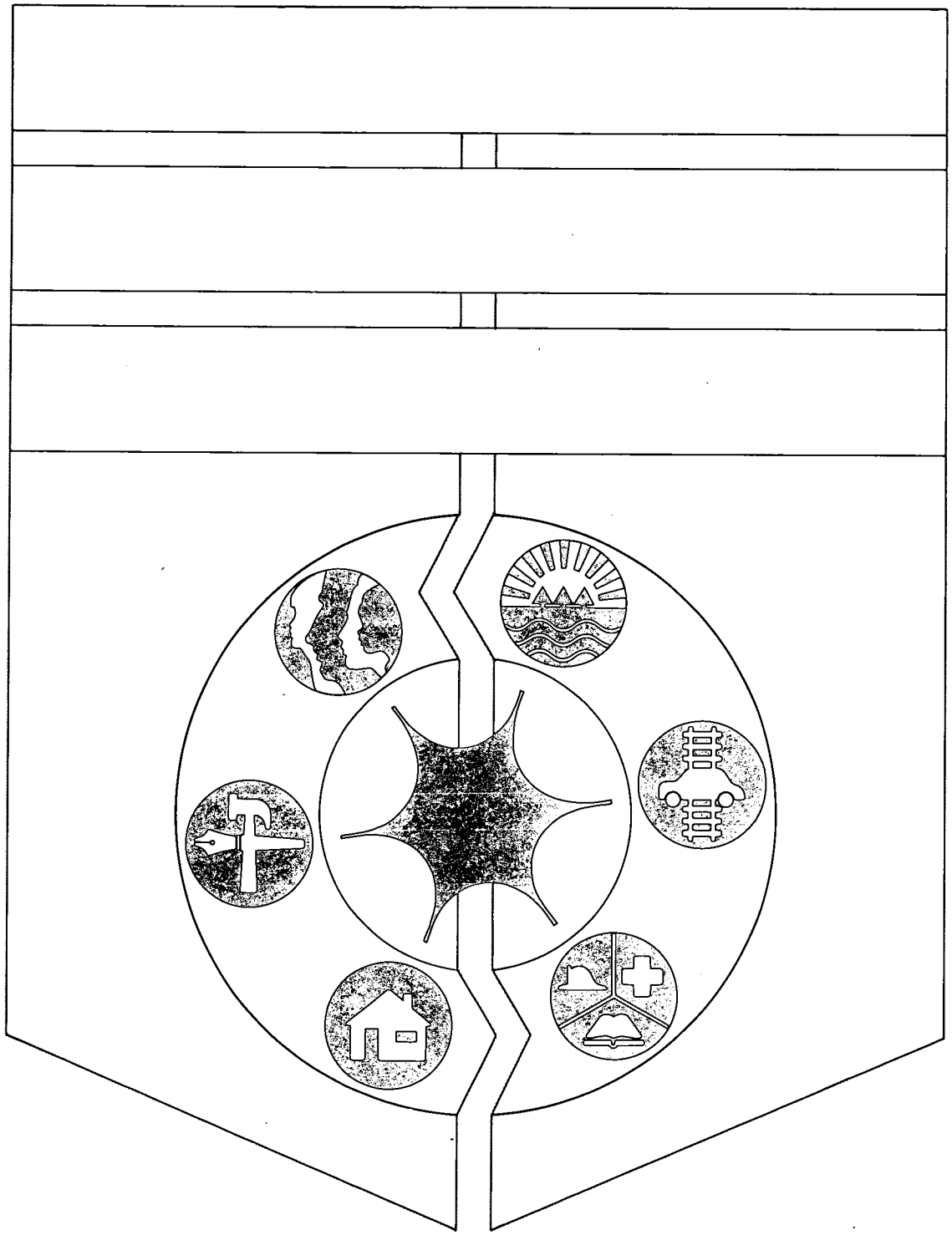
All of the above relationships are based on the cost of a new facility developed at today's prices.

Figure 4.5

ANNUAL OPERATING COST PER $100 OF NEW CAPITAL INVESTMENT
(Excluding Debt Service)



Source: Montgomery County Planning Board staff.



Chapter Five

Focus

FOCUS 5

EXECUTIVE SUMMARY

Introduction

This is the fifth in a series of growth policy reports. These reports are intended to help focus an evolving perspective of the growth management process in the County, and to assist in the guidance and coordination of the many ongoing activities that together constitute that process over the year. While previous reports contained action recommendations relevant to the situation at the time, they also explored a developing sequence of tools and ideas.

The first report, called Framework for Action, in addition to describing issues of the day and a general policy approach to them, laid out a preliminary concept model of the comprehensive growth management process. One of the key ideas in this model was the necessity to distinguish between the public and the private sectors, and to recognize the fiscal and constitutional limitations on local government capabilities.

The second report, called Fiscal Impact Analysis, and its Sequel--Environment and Transportation, produced recommendations derived from testing the fiscal implications of alternative future rates of growth. It also developed a computerized fiscal analysis model, and outlined the importance of the "level of service" idea to the concept of fiscal management.

The third report, called Forecast--People, Jobs and Housing, was a technical report that documented the Planning Board's then-current population forecasts. It also outlined a computerized set of linked demographic, economic, and land use models. One of the key ideas that subsequently developed out of this experience was the "investment risk analysis" concept. This involved

the need to accept a range of uncertainty in forecasting, and the corollary need to adjust the public investment planning process, so that it will test the implications of both the top and bottom of the forecast range.

The fourth report, called Carrying Capacity and Adequate Public Facilities, recommended improvements to the County's Adequate Public Facilities Ordinance, and proposed the preparation of a countywide staging policy, based on the tools and ideas developed to date. One of the key ideas outlined was the "carrying capacity concept," which involved the selection and analysis of critical elements within the public service systems, through implementation of another idea, called the "adequate public facilities" concept.

This fifth report, called Planning, Staging and Regulating, carries out the recommendations of the fourth report, and produces a draft countywide staging policy for public review and comment. One of the key ideas developed is the concept of "staging," as providing the necessary and desirable link between the concepts of "planning" and "regulating," on the private sector side of growth management, and between "planning" and "budgeting," on the public sector side. Ways are outlined by which the implementation of this linkage can fit within the existing charter, statutes, and structure of the Montgomery County Government.

Chapter 1 - Framework

Chapter 1 outlines a narrative argument that includes the following major points. Prior to 1970, urban planning was based largely on the implicit concept of growth "accommodation." Since 1970, planning has been shifted to a growth "management" approach, in response to public demand. The growth management approach requires use of the police power to limit growth, and requires a way of making judgments about when to exercise it. The police power is a limited power, constrained by constitutional limitations enforced by the courts. Successful exercise of the police power for growth management requires an explicit "public purpose rationale."

The term "carrying capacity" embodies the ideas from which such a rationale may be drawn. By dividing total growth into its private sector and public sector components, it is possible to portray the capacity of the public sector, to carry the weight of the private sector, in terms of an equation:

$$\frac{\text{Public}}{\text{Private}} = \text{Level of Public Service}$$

By developing a level-of-public-service measuring technique, it is possible to translate this general equation into a specific tool for growth management.

In Montgomery County, this process is used to implement an "Adequate Public Facilities" Ordinance, which is an adjunct to the Subdivision Regulations. It requires that no subdivision be approved, if the total public facilities available under the adopted Capital Improvements Program (CIP) are not adequate to the task. Eight specific facilities are identified. Administration of this Ordinance has revealed technical difficulties that are characterized by the term, "a scale dilemma."

To improve the County's ability to manage growth through the adequate public facilities method, a revised approach is recommended, called the "Comprehensive Staging Plan" approach. This involves the adoption of a Comprehensive Staging Plan, (CSP), as an amendment to the County's General Plan; and its subsequent monitoring and updating on a periodic basis. This Plan establishes interim thresholds of private sector growth, that are keyed to incremental additions of public facility projects in the Capital Improvements Program.

These thresholds would constitute binding ceilings on the regulatory approval process for private development projects, until such time as the plan is amended. The plan also would provide guidance to the capital programming process, through its background information on facility impacts, fiscal impacts, and private sector growth forecasts.

This information would be portrayed in a simple format, called the "staging chart technique," which displays in graphic, mapped, and tabulated form, the interplay of forecasts, facilities, and threshold levels. A staging chart is prepared for each of a number of subareas of the County, called "Policy Areas," so that different threshold levels can be established, in accordance with the unique conditions that relate to each area.

Several administrative changes are desirable, to permit this Comprehensive Staging Plan to become an effective coordinating mechanism for the achievement of growth management objectives. One is an amendment to the provisions governing the release of building permits, to expand the coverage of the APF measurement, to include all forms of private sector growth. At present, only subdivision projects are so measured.

The other is to shift the adoption cycle of the Capital Improvements Program from an annual to a bi-annual basis. By coordinating this cyclical procedure with an equivalent bi-annual review of the Comprehensive Staging Plan, there will be created a new institutionalized coordinating mechanism, which we have called the "CSP-CIP Complementary Couplet."

As an aid to public understanding, the essential ideas outlined in this chapter have been graphically summarized in: (1) a symbol of the growth management process; portrayed on the front cover of this report; and (2) a symbol of the CSP-CIP Couplet, portrayed on the back cover.

Chapter 2 - Facilities

Chapter 2 describes the technical background to the development of computerized simulation models for the sewerage and transportation network systems of the County. Geographic areas that act as data containers, related to the branches of these networks, are described under the terms "sewer sheds" and "traffic sheds." A geographic cross-reference file is described, that permits the conversion of impact assessment analysis from one system to another.

The operations of the sewerage system simulation model are described, as well as its application to a test of the sewerage capacity impact of the latest private growth forecasts. It is concluded that two sewerage projects are of pressing importance: (1) a new pumpover transmission line, or alternative solution, to relieve the over-congested situation at the bottom of the Rock Creek Basin; and (2) a new sewage treatment plant at the already-selected site in the Rock Run Basin, or an alternative long-term capacity commitment, through existing treatment plants in other jurisdictions. Engineering feasibility work should proceed immediately on these two projects.

In spite of the relative urgency associated with these two projects, there is a long pipeline of already-approved development projects, so that the County will not immediately cease growth until the sewer capacity problem is solved. In building a long-term growth management system, it has been assumed that these sewerage capacity problems will, in fact, be resolved; and that other system conditions may become more critical than sewerage in the future.

An analysis of the sensitivity of stress of the various public systems in the County concluded that the order of priority was as follows: (1) sewerage, (2) transportation, (3) fiscal, (4) schools, and (5) stream valley parks.

Transportation was judged to be the most significant, beyond sewerage, in setting stress threshold levels at the present time. Accordingly, the transportation system was analyzed, and a new level of service standard was derived, one that keys to the relative availability of transit service in the future.

The application of this standard led to the development of four transit level of service categories, ranging from virtually no transit service, to a full range of rapid rail, mixed bus, park-and-ride, and walking access alternatives. By fitting policy areas to the geographical distribution of these four levels of transit service, different normative standards of acceptable highway congestion levels were developed, ranging from the least, in those areas where no transit is available, to the highest, in those areas with the most transit is available. From these standards were derived a set of threshold levels for private growth, expressed in terms of residential dwelling units, and square footage of non-residential space, for each of the policy areas.

Chapter 3 - Forecast

This chapter describes the methodology and results of a forecasting process, that draws on the perspective of the planning staffs in other jurisdictions within the metropolitan area. Under a process called "Cooperative Forecasting," developed under the auspices of the Metropolitan Washington Council of Governments, the planning staffs of the various jurisdictions meet collectively to review and critique individual forecasts, prepared within their jurisdictions, and to contrast these with a single regional forecast, prepared through a simulation modelling process called the regional model.

The results of the most recent forecast, adopted in 1978, show a slight decline in the forecasted levels of growth, over the previous forecast adopted in 1976. Steeper reductions have been made in the forecast for Prince George's County, Fairfax County, and the District of Columbia, than for Montgomery County, possibly reflecting a more consistent view of the future among all the jurisdictions in the 1978 cycle.

An important feature of the 1978 forecast is its recognition of the uncertainty inherent in such forecasting. This uncertainty is expressed by producing not just a single forecast number, but rather a range with a high, low, and most probable intermediate set of numbers. It has now become explicitly understood that the use of such forecast ranges, in the planning process, requires the additional step of performing a "risk analysis," which involves using both the high and the low ends of the range, to test for carrying capacity impact, before a final planning judgment is reached.

Chapter 4 - Fiscal

This chapter describes a computerized simulation model for assessing the fiscal impact of growth, in either, or both, of the private and public sectors. It outlines the assumptions used in applying this model to testing the fiscal impacts of the new growth forecast, and their relationships to the private sector growth thresholds proposed in the Comprehensive Staging Plan. It concludes that all of the three growth forecasts should produce incremental revenues that slightly exceed the incremental costs associated with servicing them, provided that the incoming growth continues to share the current characteristics of the growth the County has been receiving over the past decade. The fiscal surplus, however, is only marginal, and is not large enough to make any significant contribution towards lowering the County's tax rate. The impact of growth on the County's budget, therefore, can be considered essentially neutral under these conditions.

Since any fiscal simulation is highly dependent on the

subtleties of the revenue assumptions made, as well as the details of the expenditure categories, it is pointed out that one of the major uses of this fiscal model can be to play "what-if" games about specific questions (i.e., if such-and-so develops, what is the fiscal impact?). Similarly, it is pointed out that the model offers the opportunity to further analyze the fiscal conditions of the County, and possibly to develop normative standards that could influence the private growth threshold levels, if such were deemed acceptable as a policy decision. In this way, the model offers the opportunity for further elaboration of the Comprehensive Staging Plan approach.

To assist in linking fiscal capacity analysis to facility capacity analysis, and coordinating both into a more integrated total growth management system, the chapter illustrates how the 1979 budget of the County can be portrayed in terms of the system elements which are used in the urban growth model that was developed to provide cohesion for the growth management process. By completing this conversion of fiscal data into the same format as used for facility analysis and forecast analysis, a comprehensive and integrated technical modelling system has been completed.

The chapter concludes with a priority ranking of capital facilities, in terms of their relative intensity of operating costs per dollar of capital costs. It is concluded that new roadways, in particular, generate the least in terms of relative ongoing future operating costs.

Action Recommendations

After due process of public hearing and discussion, it is recommended that the County Council take the following actions:

(1) Amend the current adopted General Plan for Montgomery County, the Wedges and Corridors Plan, to include a Comprehensive Staging Plan element, which has two effective normative guidelines, as follows:

(a) the Stage 1 residential, and non-residential, threshold ceilings, for each of the policy area and traffic sheds of the County, as identified in the attached table entitled "Summary Staging Recommendations by Policy Areas," and as described in the "Staging Recommendations" section, at the conclusion of this chapter; and

(b) the sewer service category boundaries, as described in the "Staging Recommendations" section, at the conclusion of this chapter.

(2) Amend the current regulations, governing the issuance of building permits, to require submission of evidence that the Planning Board has approved the project for adequacy of public facilities, under the same criteria as are contained in the Adequate Public Facilities Ordinance of the Subdivision Regulations.

(3) Amend the Adequate Public Facilities Ordinance, to stipulate that a public facility project must have at least 50 percent of its total construction cost funded within the six-year timeframe of the adopted CIP, in order to be counted as an adequate facility under the Adequate Public Faci-

lities Ordinance.

(4) After joint discussion among the Council and Executive, and after mutual resolution of any desirable scheduling considerations, adopt, by resolution, an administrative procedure, under which the Comprehensive Staging Plan, and the Capital Improvements Program, would each be subject to a bi-annual review and adoption, in alternating years of a continuing cyclical process, with provisions for such amendments, as may be needed during the intervening periods, to be adopted, as amendments to the main document, at a stipulated time during the off year, with a further provision for the emergency adoption of amendments at any time if warranted.

Staging Recommendations

Introduction

The following section illustrates the staging recommendations for each of a series of subareas of the County. The so-called policy area is used wherever this is the smallest geographic unit, that fits logically to the analytic technique, from which the normative standard is derived. In those cases where it was reasonable to use a smaller geographical unit, the traffic shed has been used, as the unit for which to display the threshold ceiling.

The staging chart technique portrays dwelling units on the vertical scale, and time on the horizontal scale. The high, low, and intermediate, private sector growth forecasts are shown by three dashed lines. A horizontal "ceiling" line shows the maximum feasible development possible under existing approved zoning. A smaller horizontal line at a lower level, called "pipeline," shows the number of dwelling units which have received a sewer allocation from the Sanitary Commission, but which have not yet proceeded to building completion. The pipeline calculation includes approvals based on capacity of the Sanitary Commission, the City of Rockville, and existing private treatment plants; and is reflective of the situation as it existed in September 1978.

The recommended threshold levels are shown as horizontal lines, and identified as Stage I, or Stage II, etc.; and are keyed to the additional road improvement projects listed in the right-hand column. In order to simplify the graphics, these projects have been clustered into five-year increments, with corresponding five-year timeframes for the threshold levels. Since the road projects extend over fifteen years into the future, they cover a range beyond that of the six-year Capital Improvements Program. They thus constitute only a recommended guideline for future additions to this program. Similarly, the estimated costs are not precise, and will require refinement.

In recognition of the proposal to amend the CSP on a bi-annual basis, which will allow for incorporation of changes in the CIP as they occur on its bi-annual basis, it is recommended that only the Stage I thresholds be adopted at this time. The Stage II, and beyond, thresholds are shown for illustrative purposes only.

The thresholds are expressed in numerical terms in the table on the left, and include the non-residential employment thresholds, expressed in square footage, although this latter is not expressed as a line on the graph. Stage I thresholds are based on the full set of road projects included in the currently-adopted CIP.

The attached maps for each area show both road projects and sewer service category boundaries. Road projects that are required to provide capacity within

the policy area are shown by a heavy solid line. Broken lines are used to indicate road projects that traverse this policy area, but are necessary to provide capacity to an adjacent policy area. Each road project is identified by a Roman numeral and letter, which keys to the list of projects on the opposite page. Roman numeral one (I) refers to projects contained within the existing CIP: and Roman numerals two (II) and three (III) refer to projects proposed in subsequent stages.

Wherever a forecast diagonal line crosses a threshold horizontal line, it indicates a potential problem of accommodating the market pressure. It should be remembered that this is essentially a timing problem, since the forecast has taken, as a given, that no development can exceed the densities and uses provided for under the adopted zoning and master plans.

The use of both a residential and non-residential threshold means that the full spectrum of private sector growth is covered. The way in which the total capacity of the road network has been proportionately divided, to achieve these two threshold levels, has been a matter of value judgment by the Planning Board and staff, after review of the background planning work leading to this study. To the extent that all other factors are constant, a change in the residential threshold can be related to a change in the commercial threshold in the opposite direction.

The commercial thresholds established are generally sufficient to accommodate the forecasted rate of employment growth. Possibly the Gaithersburg, Germantown, and Colesville policy areas may find market pressures exceeding these thresholds during the latter part of the century. However, all the other areas should be able to accommodate the amount of employment forecasted, which means that these thresholds will not impinge on the revenue produced from the non-residential assessable base, which revenue was an integral part of the fiscal conclusions mentioned earlier.

The following descriptions of individual policy areas are grouped according to the four levels of transit service categories, as follows:

Group I

These are outlying non-sewered areas, where only park-and-ride transit availability is planned, and where, on the aggregate, existing transportation capacity does not impose a constraint on development in the foreseeable future. Here the allowable percentage of vehicle miles travelled (VMT) at level-of-service E (LOS E) or worse has been established at zero percent. Further staging in these areas will be based upon zoning, sewer extension policy, and a review of aggregate transportation impact in succeeding CSP reviews.

Group II

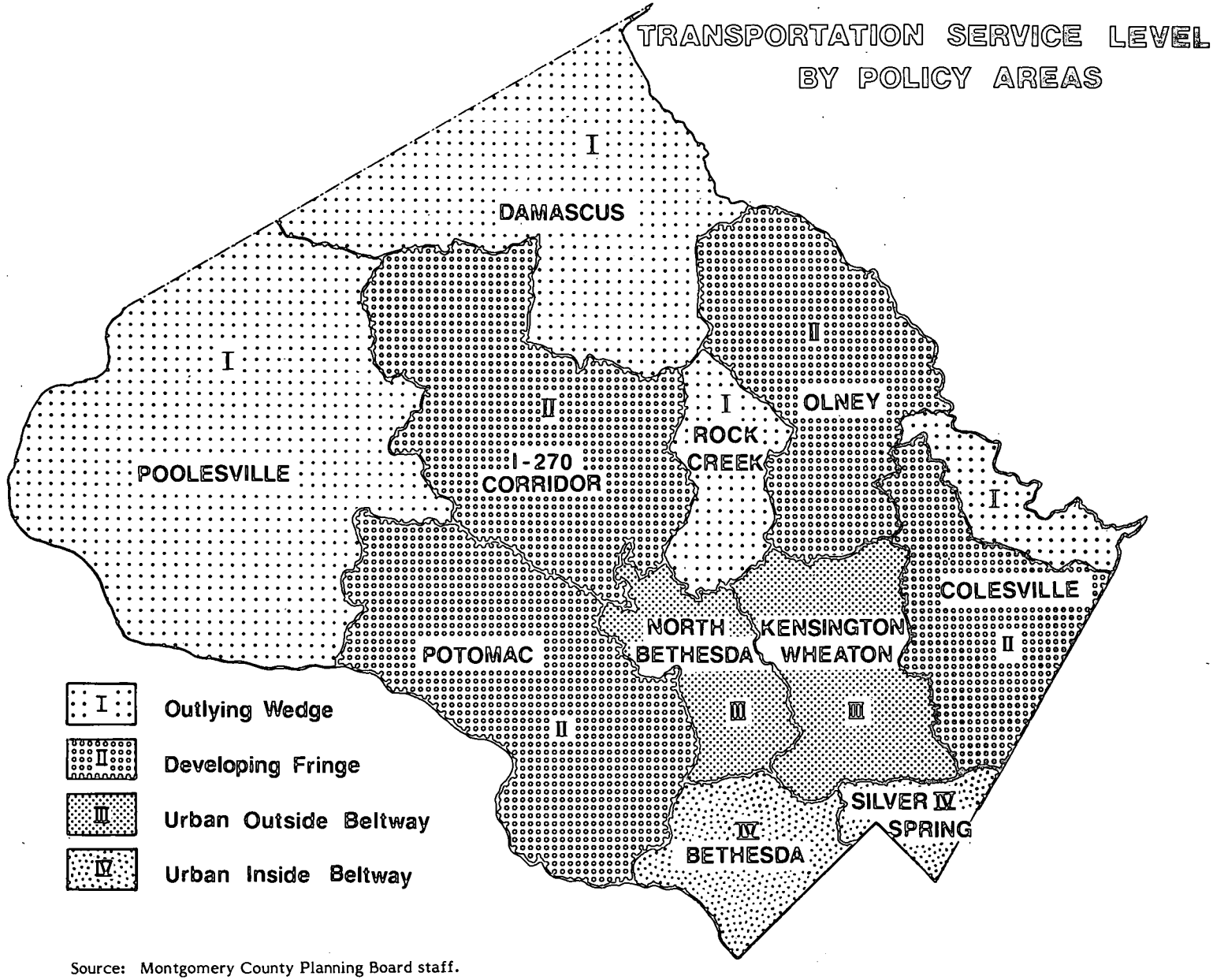
These are developing fringe areas, which will soon have park-and-ride access to Metrorail, in addition to regional bus and/or commuter rail access. Here the acceptable percentage of VMT at LOS E or worse has been established at 10 percent.

Group III

These are areas along the two Metrorail lines, which will soon have an extensive range of transit service available. Here the acceptable percentage of VMT at LOS E or worse has been established at 50 percent.

Group IV

These are areas within the Beltway that will soon have a full range of transit availability. They are distinguished from Group III by having more frequent rail



Source: Montgomery County Planning Board staff.

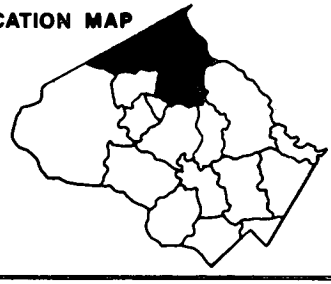
DAMASCUS POLICY AREA

SEWER SERVICE CATEGORY

- S-1 & S-2
- S-3
- S-4
- S-5
- S-6
- *5 COMMUNITY SERVICE AREA
- (4) PROPOSED SERVICE CATEGORY

- POLICY AREAS & TRAFFIC SHEDS
- PROPOSED SERVICE AREA
- REQUIRED ROADWAY OF ADJOINING AREA
- REQUIRED ROADWAY WITHIN AREA
- M METRO

LOCATION MAP



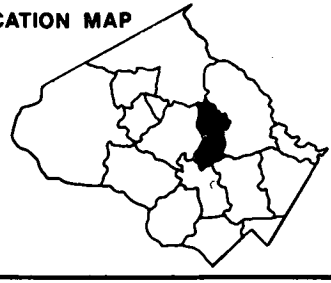
ROCK CREEK POLICY AREA

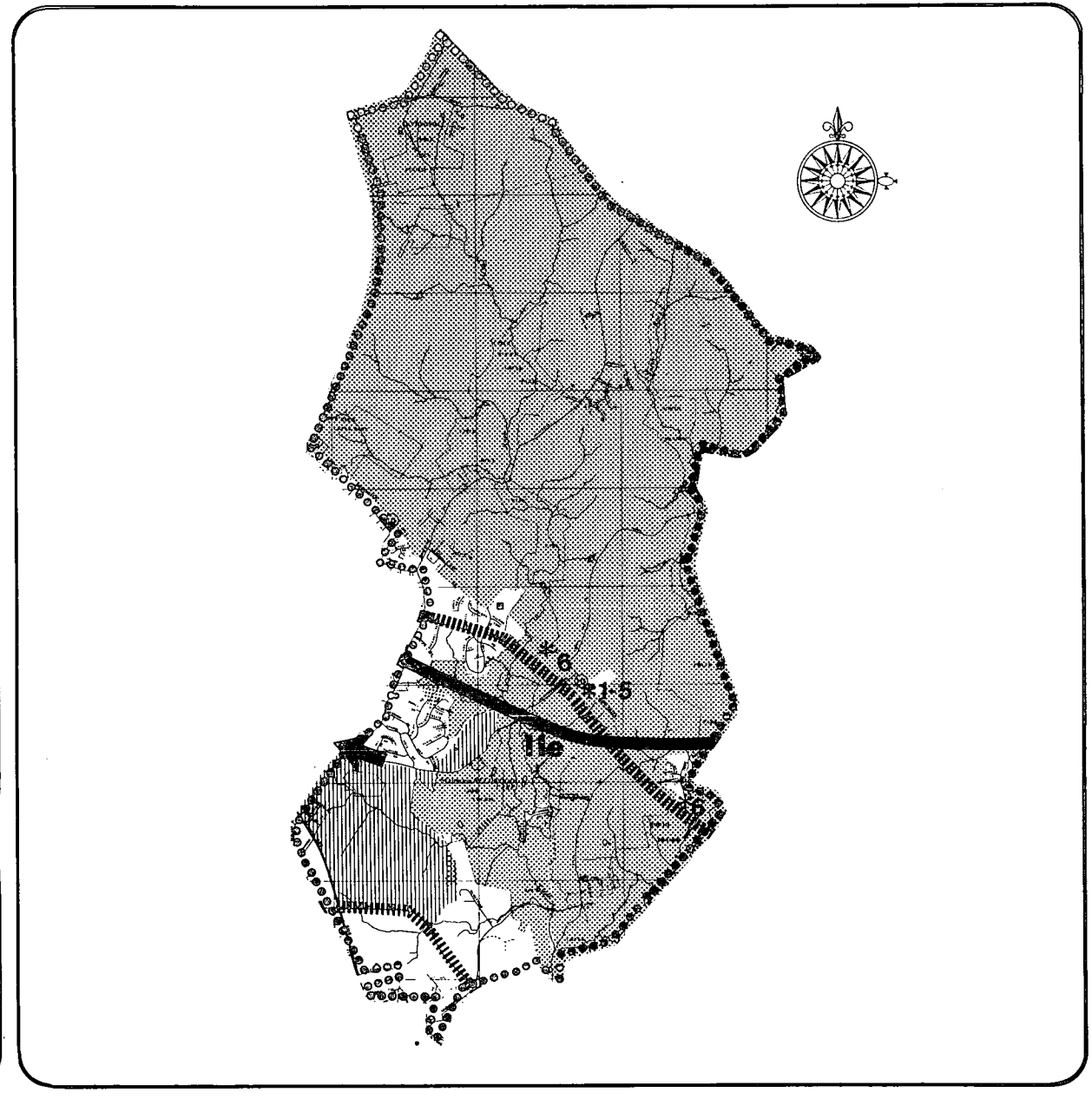
SEWER SERVICE CATEGORY

- S-1 & S-2
- S-3
- S-4
- S-5
- S-6
- *5 COMMUNITY SERVICE AREA
- (4) PROPOSED SERVICE CATEGORY

- POLICY AREAS & TRAFFIC SHEDS
- PROPOSED SERVICE AREA
- REQUIRED ROADWAY OF ADJOINING AREA
- REQUIRED ROADWAY WITHIN AREA
- [M] METRO

LOCATION MAP





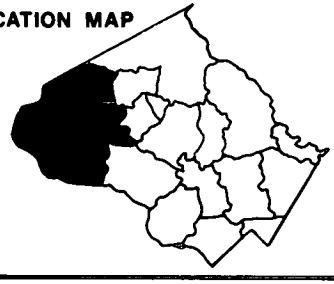
POOLESVILLE POLICY AREA

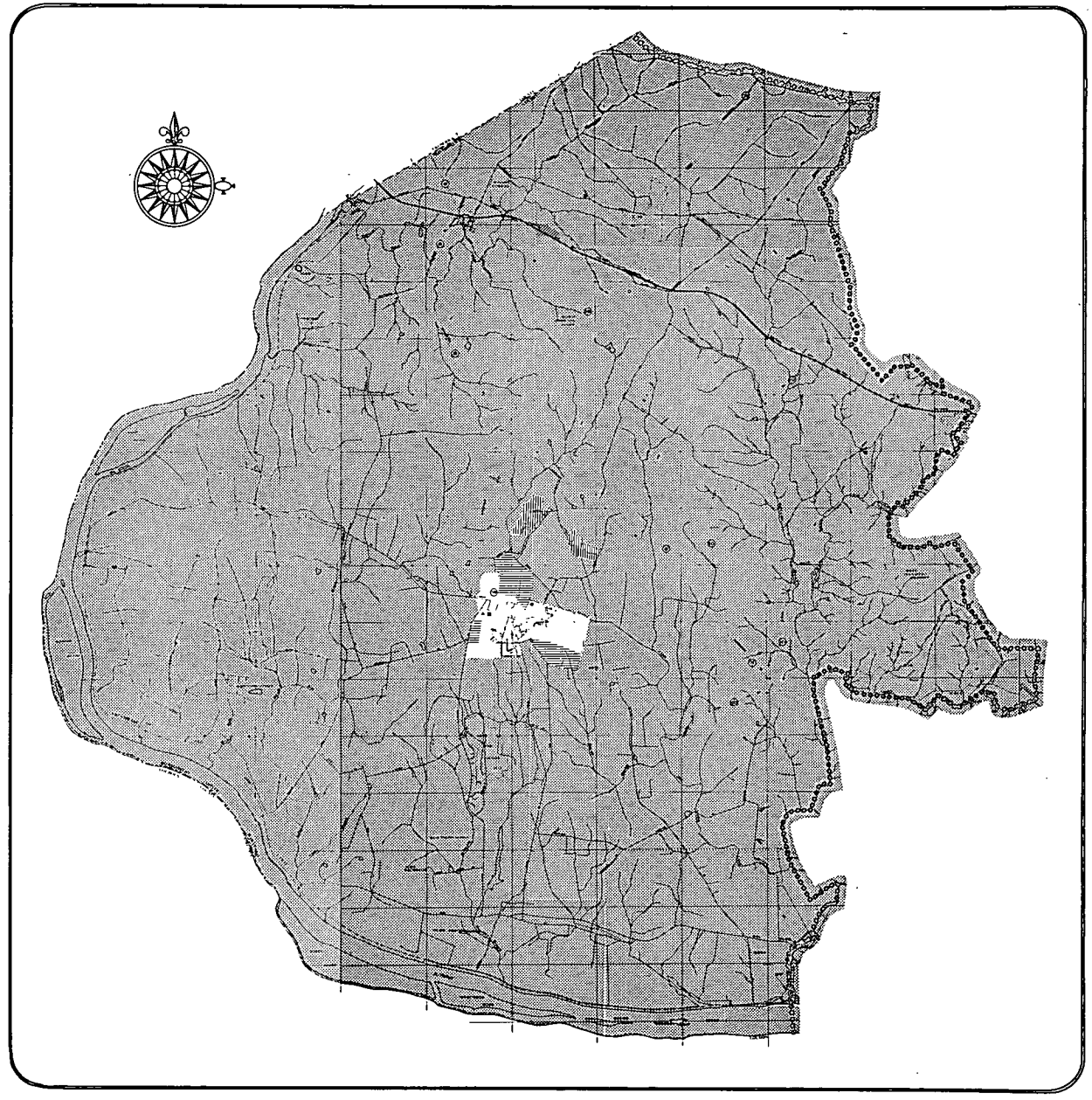
SEWER SERVICE CATEGORY

- S-1 & S-2
- S-3
- S-4
- S-5
- S-6
- *5 COMMUNITY SERVICE AREA
- (4) PROPOSED SERVICE CATEGORY

- POLICY AREAS & TRAFFIC SHEDS
- PROPOSED SERVICE AREA
- REQUIRED ROADWAY OF ADJOINING AREA
- REQUIRED ROADWAY WITHIN AREA
- [M] METRO

LOCATION MAP





GROUP II - POTOMAC POLICY AREA

Transportation Thresholds

In the Potomac Policy Area, analysis indicates a Stage I limit of 1,800 additional dwelling units, until Democracy Boulevard and Montrose Road extensions are at least 50 percent programmed for construction. Democracy Boulevard should be extended as a two-lane section between Gainsborough Road and Kentsdale Drive.

At this time, it is the proposed policy of the Planning Board to maintain the remaining roadways in the Potomac area in their current two-lane configuration. Therefore, after Democracy and Montrose extensions are programmed for construction, the full amount of residential zoning threshold, i.e., 7,000 additional dwelling units, would be allowed.

This amount of development would result in congestion in excess of the 10 percent LOS E, or worse, threshold standard for this policy area. However, since Potomac is essentially a self-contained area with little or no need to serve through traffic, the consequence of accepting a lower level of service in exchange for maintaining a two-lane highway network is an acceptable policy option in the context of this proposed staging plan.

Sewer Service Boundaries

Once Stage II roads are programmed for construction, development will be permitted up to the zoned ceiling. The Draft Master Plan strongly recommends putting all R-200 zoned land into the sewer envelope (see map). In the absence of sewer service, it would be unlikely that subdivisions over 50 units, which require moderately priced dwelling units, would be feasible. The southwest portion of the area, recommended for a change to category five, is zoned RE 2, but is recommended for a change to RE 2C. Sewer service is critical to the use of the cluster method and the protection of natural features.

GROUP II - OLNEY POLICY AREA

Transportation Thresholds

Within the policy area, the Olney Traffic Shed constitutes the developing area within the sewer envelope, and the remaining portion is low-density residential with significant amounts of land currently operating as working farms. The transportation staging limitations apply to the sewered area.

In the Olney Traffic Shed, two projects are currently under construction: 1) reconstruction of the Georgia Avenue/MD Route 108 intersection; and 2) the widening of Georgia Avenue to six-lanes from Bel Pre Road to Norbeck Road realigned. The transportation Stage I threshold limitation of 1,700 dwelling units requires the implementation of these two projects. Dwelling units achieved under transfer of farmland development rights will not be counted against this limitation.

A Stage II threshold limitation of 5,000 additional dwelling units is recommended when Georgia Avenue, from Norbeck Road to MD Route 108, is programmed for construction. This Stage II limit corresponds to the ultimate number of additional dwelling units achievable through 1995 under the proposed Olney Master Plan, including a recommendation for 5-acre zoning in a substantial portion of the non-sewered area with transfer of development rights to the sewered area.

Sewer Service Boundaries

Farmland preservation, transfer of development rights (TDR) and zoning policies will be used to manage growth in the non-sewered area.

The proposed transfer of development rights receiving areas has been recommended in the Preliminary Olney

Master Plan. The success of the program depends on the location, size, and development potential of the receiving areas. The proposed densities in the receiving areas require public sewer and water, so the receiving zones may be phased in accord with timing and sequence of development policies of the Master Plan. The provision of these services will be dependent on the developer acquiring enough development rights to allow higher density.

GROUP II - I-270 CORRIDOR POLICY AREA

Transportation Thresholds: General

This Policy Area includes the major future corridor city growth centers of Gaithersburg, Germantown, and Clarksburg. To support this growth, a complex network of highway and transit facilities are envisioned by the General Plan. Timing of growth in the I-270 Corridor is critical. Taking a time slice view of the I-270 Corridor in 1995 results in three distinctly different stages of development.

It is recommended that the Clarksburg area remain relatively undeveloped through 1995. Staging and sewer policy should be designed to control growth in this area because funding for transportation facilities to serve the area is unlikely. Any excessive development in the area would be at the expense of development in Germantown and Gaithersburg which utilize common downstream transportation facilities such as I-270 and Maryland Route 355.

In 1995, the Germantown area will be part of the developing fringe area of the County. Growth until then should be limited to the amount that can be accommodated by specified highway projects. Therefore, staging thresholds are recommended which would limit highway congestion to no more than 10 percent at LOS E, or worse. After 1995 this area is expected to be served by a fuller range of transit improvements which will result in a total level of transportation service concept to guide staging.

The third type of development will occur in the Gaithersburg area which will be the most intensely developed in the I-270 Corridor by 1995. The area will be served by the Shady Grove terminal station of the Metrorail system and will have a level of transit service somewhat less than the Group III Policy Areas of North Bethesda and Kensington-Wheaton, yet significantly higher than the developing fringe areas of Germantown, Potomac, Olney and Cloverly.

Transportation Thresholds: Germantown East Traffic Shed

The Germantown East Traffic Shed analysis indicates that the current roadway system can accommodate a Stage I limit of 1,500 additional dwelling units.

The Stage II limit of 8,000 dwelling units, which is well beyond the high growth forecast of 3,350 dwelling units, will require the widening of I-270 to eight-lanes between Montgomery Village Avenue and MD Route 118, or the widening of Frederick Avenue (MD 355) to MD Route 27.
The extension of the Eastern Arterial from Montgomery Village Avenue to Ridge Road (MD 27), or the extension of Watkins Mill Road to MD Route 355, are additional long term projects which would allow the ultimate development of the Germantown East Traffic Shed.

Transportation Thresholds: Germantown West Traffic Shed

In the Germantown West Traffic Shed, the analysis

identified a Stage I threshold of about 3,000 additional dwelling units until Great Seneca Highway* and Germantown Road (MD Route 118) are programmed for construction as four-lane divided highways. Since this threshold is well below the 5,512 dwelling units committed by existing sewer authorizations, a sewer recapture policy must be stressed in the interim period.

After the two roadways are at least 50 percent programmed for construction, highway capacity will exist to accommodate the Stage II threshold of 9,000 dwelling units. Some excess capacity will exist which, in combination with other transportation projects, will be needed to reach the zoned ceiling capacity of 22,600 dwelling units.

The widening of I-270 to eight-lanes, widening of Clopper Road, and the implementation of improved transit service are the long term improvements which will allow the Germantown Traffic Shed to grow beyond the Stage II, 9,000 dwelling unit limitation.

Sewer Service Boundaries:
Germantown East and West Traffic Sheds

Changes to the sewer categories in Germantown are consistent with the recent staff report on proposed amendments to the Germantown Master Plan. Each area is adjacent to an area with on-going development approvals, and thus does not represent a leap-frogging of development. The recommended timing change complements the County Council's decision to place the Great Seneca Highway in the program for construction.

* Great Seneca Highway has been placed in the program for construction in May 1979, by action of the County Council.

These sewer category changes will permit Germantown to maintain its pace of development (see map).

Transportation Thresholds:
Gaithersburg Traffic Sheds (Montgomery Village, Gaithersburg, Route 28, and Shady Grove)

The 1995 percentage of VMT of LOS E, or worse, predicted by the transportation model, was 8 percent. This result was based on the set of roadways, employment trends, and high growth forecast of dwelling units shown in the chart for 1995. Since the transportation level of service is better than the 10 percent acceptable standard, additional growth above the amount tested could be accommodated.

In 1995, these four traffic sheds will enjoy a level of transit availability better than in any other Group II Policy Area. Transit service will include the Metrorail terminal station at Shady Grove, B & O commuter rail service and a community bus service.

With this level of transit service, it would be reasonable to allow the highway VMT at LOS E, or worse, to exceed the 10 percent standard. A staging threshold of 23,000 dwelling units is recommended, which is less than the current zoning ceiling of 34,000 dwelling units.

Sewer Service Boundaries:
Gaithersburg Traffic Sheds

The area to the south of Route 28, that is recommended for change, is zoned R-200; this is consistent with the Draft Potomac Master Plan. Its development would supply housing needed for the projected employees in the Shady Grove area. It would not be possible to develop the area to an R-200 density without public sewer.

GROUP II - COLESVILLE POLICY AREA

Transportation Thresholds:
Cloverly Traffic Shed

For the Cloverly Traffic Shed, analysis of peak hour and daily traffic projections indicates that a Stage I limitation of 1,000 additional dwelling units be set until the widening of New Hampshire Avenue to a four-lane divided highway between Randolph Road and Briggs Chaney Road is programmed for construction.

After the widening is programmed for construction, a Stage II limitation of 5,000 additional dwelling units is recommended.

Sewer Service Boundaries:
Cloverly Traffic Shed

It is recommended that areas within the Cloverly traffic shed which are now in categories four and five should be placed in category six, to better coordinate the sewerage planning with the likely timing of proposed transportation improvements.

The development pipeline is only 500 units less than the proposed Stage I limit of 1,000 units through 1990. Beyond 1990 an additional 4,000 unit threshold is proposed.

Thus, for the purposes of 10 year water and sewerage planning purposes, sufficient land exists in categories 1-3 for the period 1979-1990. Also, the current Master Plan in process should look further into these sewer service categories, and make recommendations for revisions if necessary.

Transportation Thresholds:
Fairland and White Oak Traffic Shed

In the Fairland and White Oak Traffic Sheds the predicted transportation level of service as measured by percentage of VMT at LOS E, or worse, is 47 percent. This is significantly more than the acceptable level for developing fringe areas of 10 percent. The 47 percent resulted from testing the high growth forecast for dwelling units in the two Traffic Sheds against the planned roadways.

The transportation level of service in these Traffic Sheds is greatly influenced by activity outside Montgomery County. A detailed analysis of traffic demands along Route 29 showed that a majority of trips had an origin in Howard County and that local development has only a minor impact on the transportation level of service.

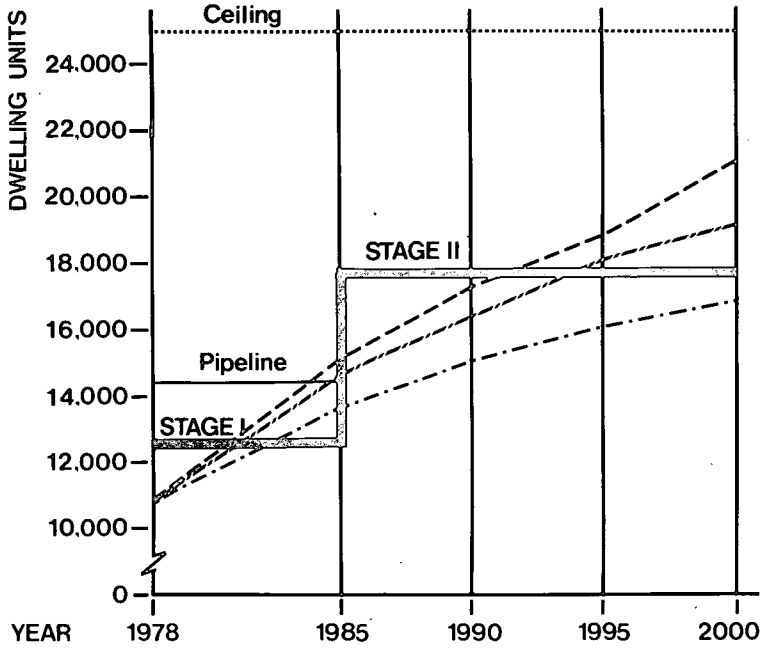
A Stage I threshold of 6,000 dwelling units is recommended. This threshold would be increase to a Stage II amount of 10,000 dwelling units when the planned highway projects are at least 50 percent programmed for construction.

The zoning ceiling of 13,200 additional dwelling units could be achieved in Stage III when improvements to the transit availability in the area are programmed. Such improvements might include light rail service or bus transit service on exclusive rights-of-way.

Sewer Service Boundaries:
Fairland and White Oak Traffic Shed

See comments on Cloverly Traffic Shed.

POTOMAC POLICY AREA



ADDITIONAL DWELLING UNITS (Cumulative)				
Ceiling	12,600		Pipeline	3,468
	1978 - 1985	1978-1990	1978-1995	1978-2000
High	4,200	6,350	8,050	9,900
Inter.	3,700	5,500	7,250	8,250
Low	2,800	4,250	5,050	5,750
THRESHOLDS				
Dwellings	1,800	7,000	7,000	7,000
Employment (Square feet)	500,000	500,000	500,000	500,000

Stage	Roadway	State or County	Estimated Cost	Limits
II	(a) Montrose Road Extended	(C)	$1,590,000[1/]	I-270 to Falls Rd
	(b) Democracy Blvd Extended	(C)	$1,294,000[1/]	Seven Locks Rd to Kentsdale Rd

[1/] M-NCPPC staff estimates based on unit cost estimates provided by MCDOT and contained in staff draft of Potomac Subregion Master Plan.

[2/] Source: Montgomery County Critical Highway Needs (1979-1998) for Secondary System by Md DOT

NOTES

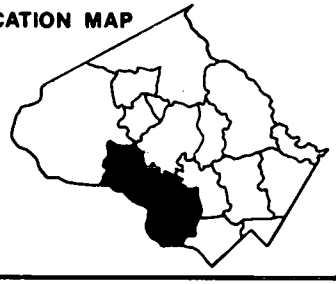
POTOMAC POLICY AREA

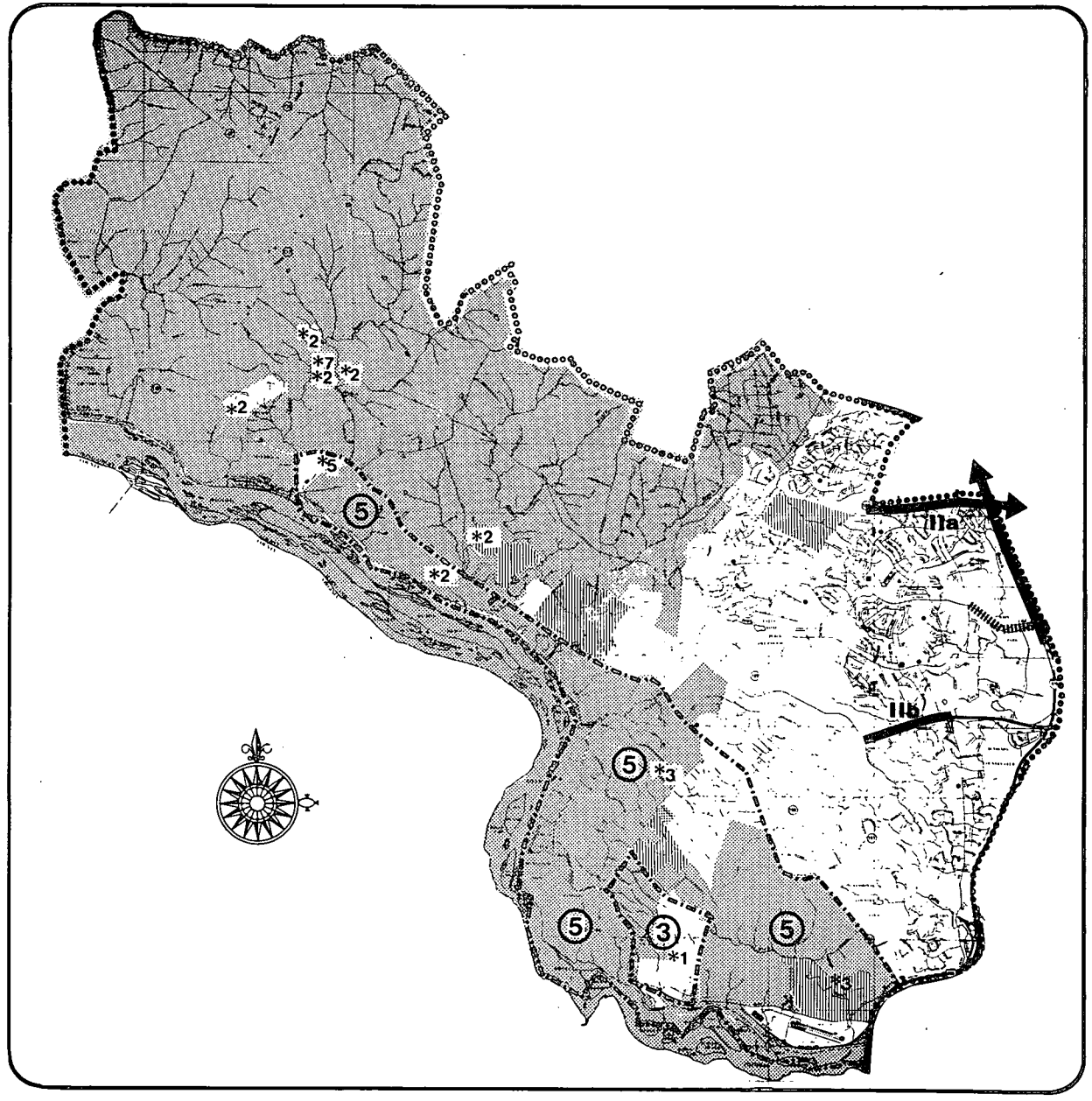
SEWER SERVICE CATEGORY

- S-1 & S-2
- S-3
- S-4
- S-5
- S-6
- *5 COMMUNITY SERVICE AREA
- (4) PROPOSED SERVICE CATEGORY

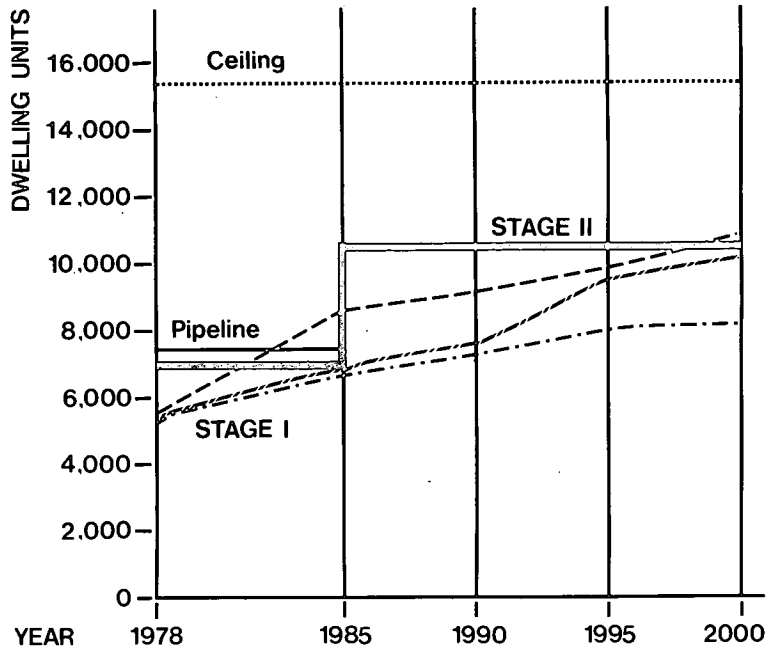
- POLICY AREAS & TRAFFIC SHEDS
- PROPOSED SERVICE AREA
- REQUIRED ROADWAY OF ADJOINING AREA
- REQUIRED ROADWAY WITHIN AREA
- M METRO

LOCATION MAP





OLNEY POLICY AREA



ADDITIONAL DWELLING UNITS (Cumulative)				
Ceiling	11,500		Pipeline	2,081
	1978 - 1985	1978-1990	1978-1995	1978-2000
High	3,000	4,000	4,500	5,350
Inter.	1,650	2,500	4,350	4,750
Low	1,500	2,100	2,700	3,000
THRESHOLDS				
Dwellings	1,700	5,000	5,000	5,000
Employment (Square feet)	200,000	400,000	400,000	400,000

Stage	Roadway	State or County	Estimated Cost	Limits
I*	(a) Md Rt. 97/108 Intersection	(S)	$4,471,000[1]	N/A
II	(a) Md Rt. 97	(S)	$9,690,000[1]	Norbeck Rd to Md Rt 108
	(e) Intercounty Connector	(S)	$80,000,000[2]	

[1]Source: Montgomery County Critical Highway Needs (1979-1998) for Secondary System by Md DOT

[2]Total Project Cost

*Included in current State Program for Construction

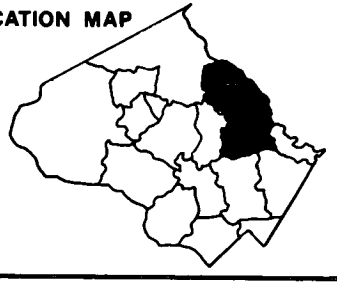
NOTES

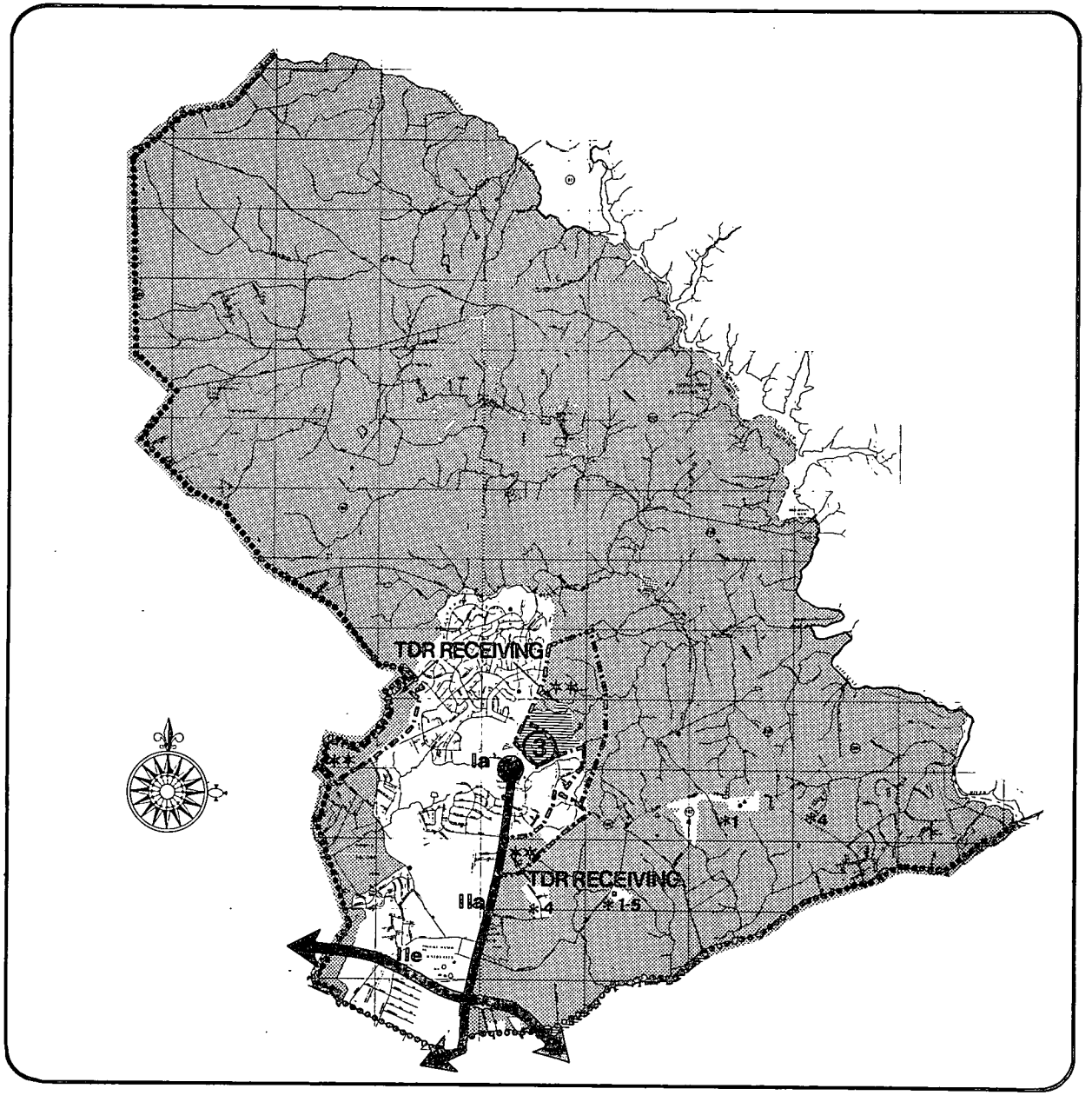
OLNEY POLICY AREA

SEWER SERVICE CATEGORY

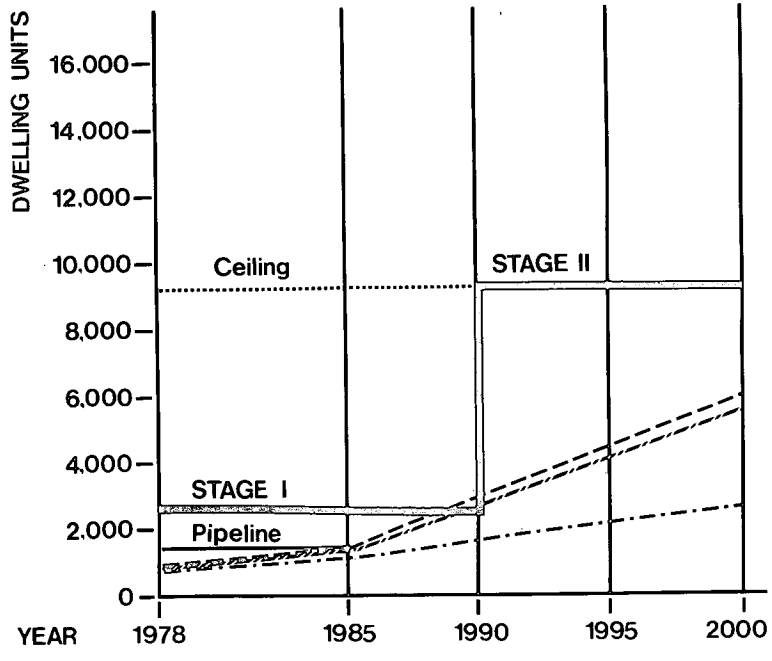
- S-1 & S-2
- S-3
- S-4
- S-5
- S-6
- *5 COMMUNITY SERVICE AREA
- (4) PROPOSED SERVICE CATEGORY
- POLICY AREAS & TRAFFIC SHEDS
- PROPOSED SERVICE AREA
- REQUIRED ROADWAY OF ADJOINING AREA
- REQUIRED ROADWAY WITHIN AREA
- M METRO

LOCATION MAP





I-270 POLICY AREA



ADDITIONAL DWELLING UNITS (Cumulative)				
Ceiling	8,000		Pipeline	389
	1978 - 1985	1978-1990	1978-1995	1978-2000
High	400	1,950	3,350	4,700
Inter.	350	1,650	2,950	4,250
Low	200	750	1,150	1,600
THRESHOLDS				
Dwellings	1,500	1,500	8000	8000
Employment (Square feet)	600,000	600,000	750,000	750,000

GERMANTOWN EAST TRAFFIC SHED

Stage	Roadway	State or Local	Estimated Cost	Limits
II	(a) Md Route 118	(S)	$10,980,000 1/ 2/	I-270 to Md Rte 355
	(b) I-270 Widening	(S)	$10,000,000 1/	Montgomery Village to Md Rte 118
	(c) Md Route 355	(S)	$15,670,000 1/	Montgomery Village to Md Rte 27

1/ Source: Montgomery County Critical Highway Needs (1979-1998) for Secondary System by Md DOT. Cost for Md Route 118 includes section of road in Germantown West Traffic Shed.

2/ M-NCPPC Staff Estimate

NOTES

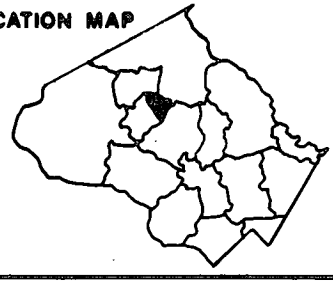
GERMANTOWN EAST TRAFFIC SHED

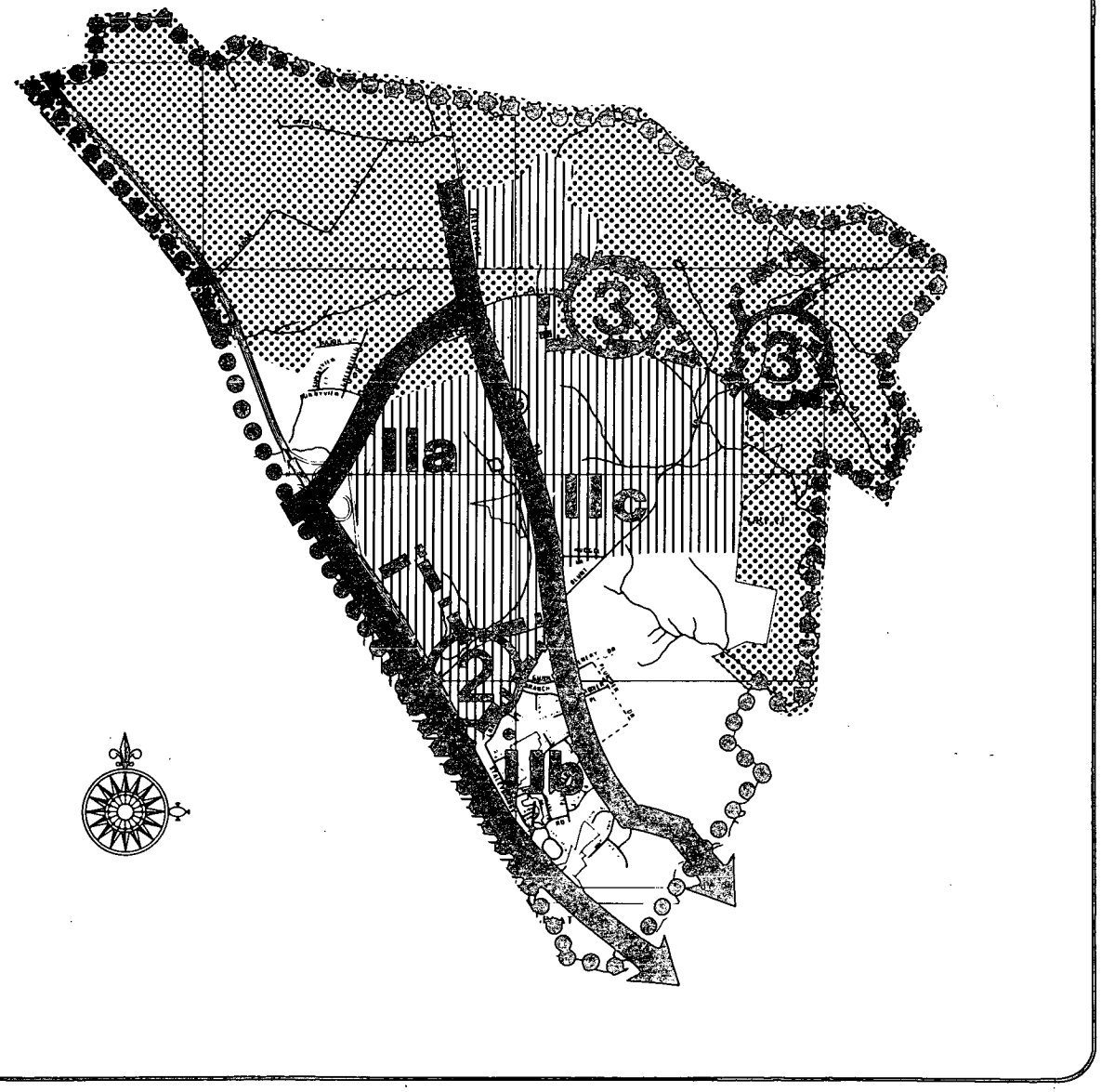
SEWER SERVICE CATEGORY

- S-1 & S-2
- S-3
- S-4
- S-5
- S-6
- *5 COMMUNITY SERVICE AREA
- (4) PROPOSED SERVICE CATEGORY

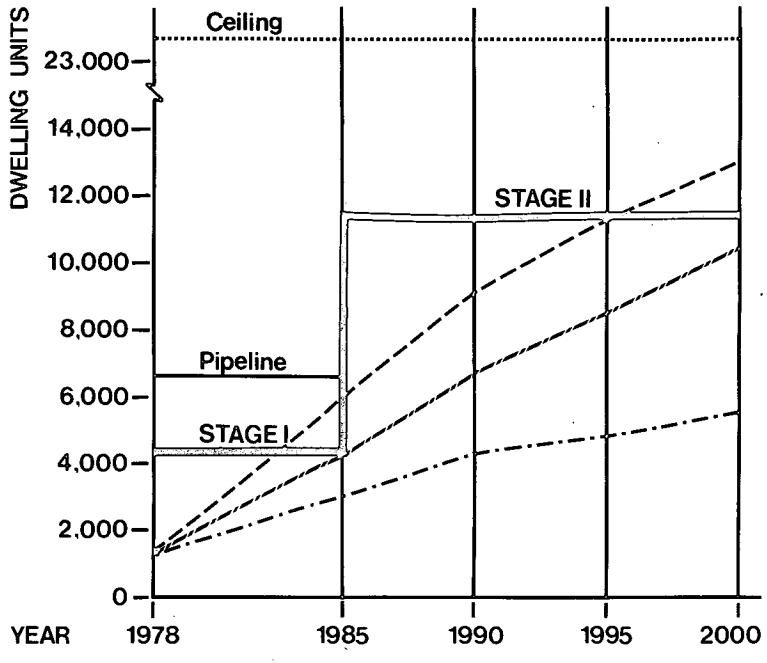
- POLICY AREAS & TRAFFIC SHEDS
- PROPOSED SERVICE AREA
- REQUIRED ROADWAY OF ADJOINING AREA
- REQUIRED ROADWAY WITHIN AREA
- [M] METRO

LOCATION MAP





I-270 POLICY AREA



ADDITIONAL DWELLING UNITS (Cumulative)				
Ceiling	22,600		Pipeline	5,512
	1978 - 1985	1978-1990	1978-1995	1978-2000
High	4,950	8,000	10,000	11,800
Inter.	2,950	5,450	7,350	9,200
Low	1,950	3,100	3,700	4,350
THRESHOLDS				
Dwellings	3,000	9,000	9,000	9,000
Employment (Square feet)	700,000	700,000	700,000	700,000

GERMANTOWN WEST TRAFFIC SHED

Stage	Roadway	State or County	Estimated Cost	Limits
I*	(a) Great Seneca Highway	(C)	$19,527,000[2]	Middlebrook Rd to Md Rte 28
II	(a) Md Route 118	(S)	10,980,000[1]	Riffle Ford to Rte 27

[1]Source: Montgomery County Critical Highway Needs (1979-1998) for Secondary System by Md DOT. Cost includes section 7 road in Germantown East Traffic Shed.

[2]Source: Montgomery County CIP
Cost includes section of road in Travilah/Darnestown Traffic Shed.

*Included in current County Program for Construction

NOTES

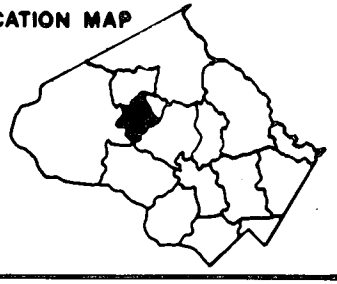
GERMANTOWN WEST TRAFFIC SHED

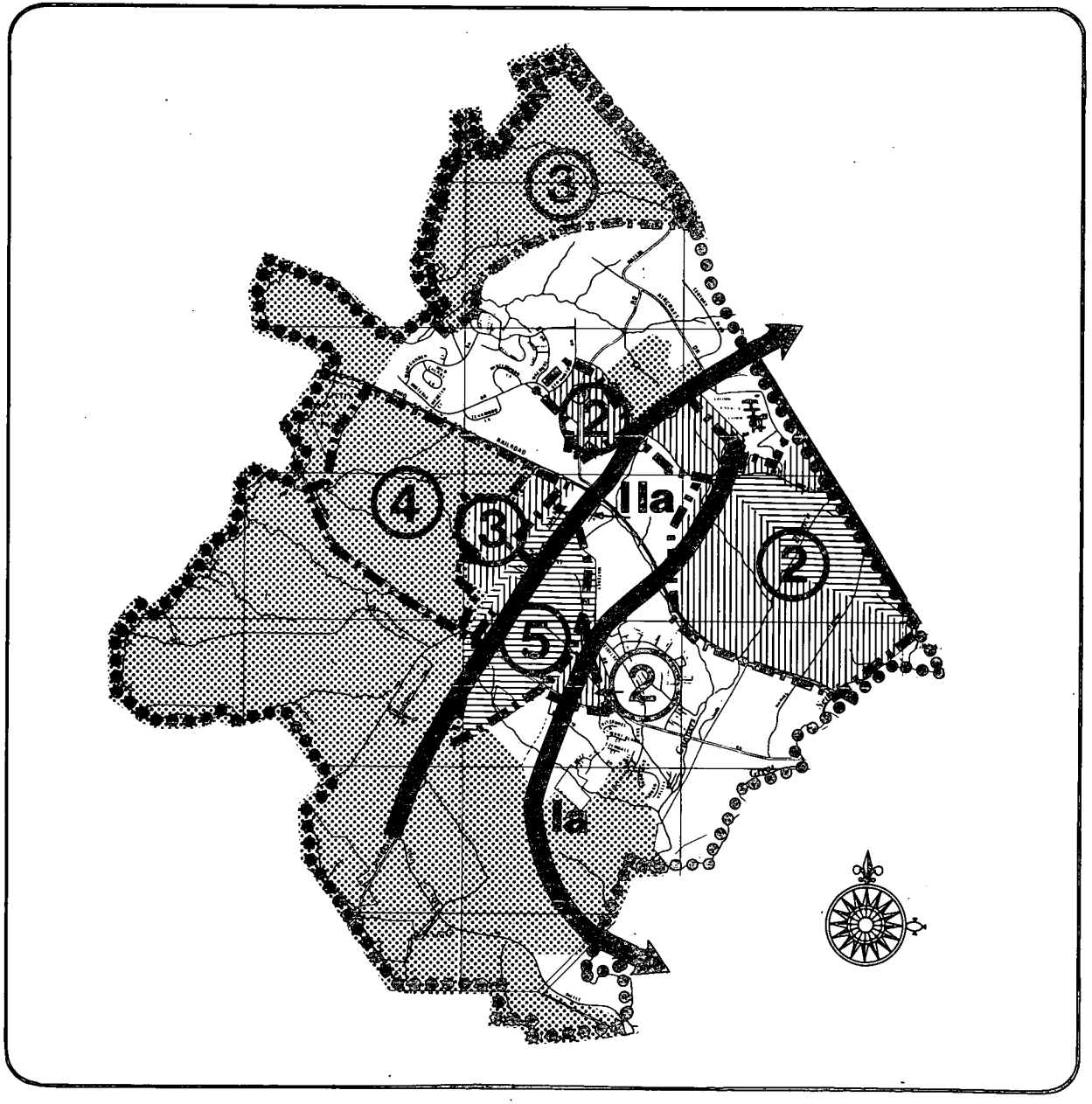
SEWER SERVICE CATEGORY

- S-1 & S-2
- S-3
- S-4
- S-5
- S-6
- *5 COMMUNITY SERVICE AREA
- (4) PROPOSED SERVICE CATEGORY

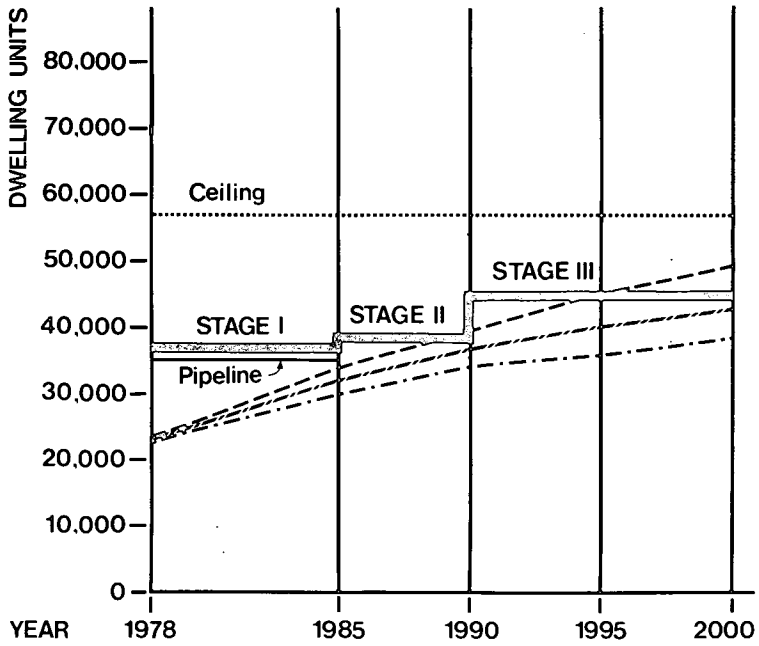
- POLICY AREAS & TRAFFIC SHEDS
- PROPOSED SERVICE AREA
- REQUIRED ROADWAY OF ADJOINING AREA
- REQUIRED ROADWAY WITHIN AREA
- [M] METRO

LOCATION MAP





I-270 POLICY AREA



ADDITIONAL DWELLING UNITS (Cumulative)				
Ceiling	34,000		Pipeline	12,221
	1978 - 1985	1978-1990	1978-1995	1978-2000
High	11,100	17,400	22,750	27,150
Inter.	8,400	13,350	17,000	20,000
Low	6,600	11,000	12,650	14,650
THRESHOLDS				
Dwellings	13,000	16,000	23,000	23,000
Employment (Square feet)	3,500,000	5,500,000	5,500 000	5,500,000

GAITHERSBURG TRAFFIC SHEDS

Stage		Roadway	State or County	Estimated Cost	Limits
I*	(a)	Great Seneca Highway	(C)	$19,527,000[1]	Middlebrook Rd to Md Rt 28
	(d)	Fields Road	(C)	$1,000,000	Piccard Dr to Md 355
	(d)	Gaither Road	(C)	$3,130,000	Shady Grove Rd to Fields Rd
	(h)	Route 355	(S)	$13,425,000	Shady Grove Rd to Mont. Village Av
	(f)	Shady Grove Rd.	(C)	$750,000[2]	Md 28 to Md 355
II	(p)	Rt. 28 Relo.	(S)	$8,240,000[2]	I-270 to Muddy Br Rd
	(q)	Rt. 28 Widening	(S)	$8,820,000[2]	Muddy Br Rd to Quince Orchard
III	(b)	Muddy Branch Rd.	(C)	$8,095,000	Md 28 to West Diamond Av
	(c)	Fields Road	(C)	$2,867,000	Muddy Br Rd to Shady Grove Rd
	(g)	I-270 Widening & Interchanges	(S)	$81,000,000	I-270 Spur to Md 118
	(i)	Quince Orchard Rd.	(S)	$6,930,000	Md 28 to Clopper Rd
	(j)	I-370 Connector	(S)	$19,670,000	I-270 to Shady Grove Metro Station
	(e)	Intercounty Connector	(S)	$80,000,000	Md Rt 28 to Georgia Av
	(k)	Eastern Arterial	(S)	$26,911,000	Mont. Village Av to Rt 28
	(n)	West Diamond Ave.	(S)	$5,180,000	Quince Orchard Rd to Rt 355

[1]Total Project Cost
[2]Source: Montgomery County Critical Highway Needs (1979-1998) for Secondary System by Md DOT

*Included in current State or County Program for Construction

NOTES

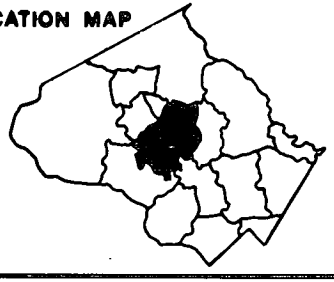
GAITHERSBURG TRAFFIC SHEDS

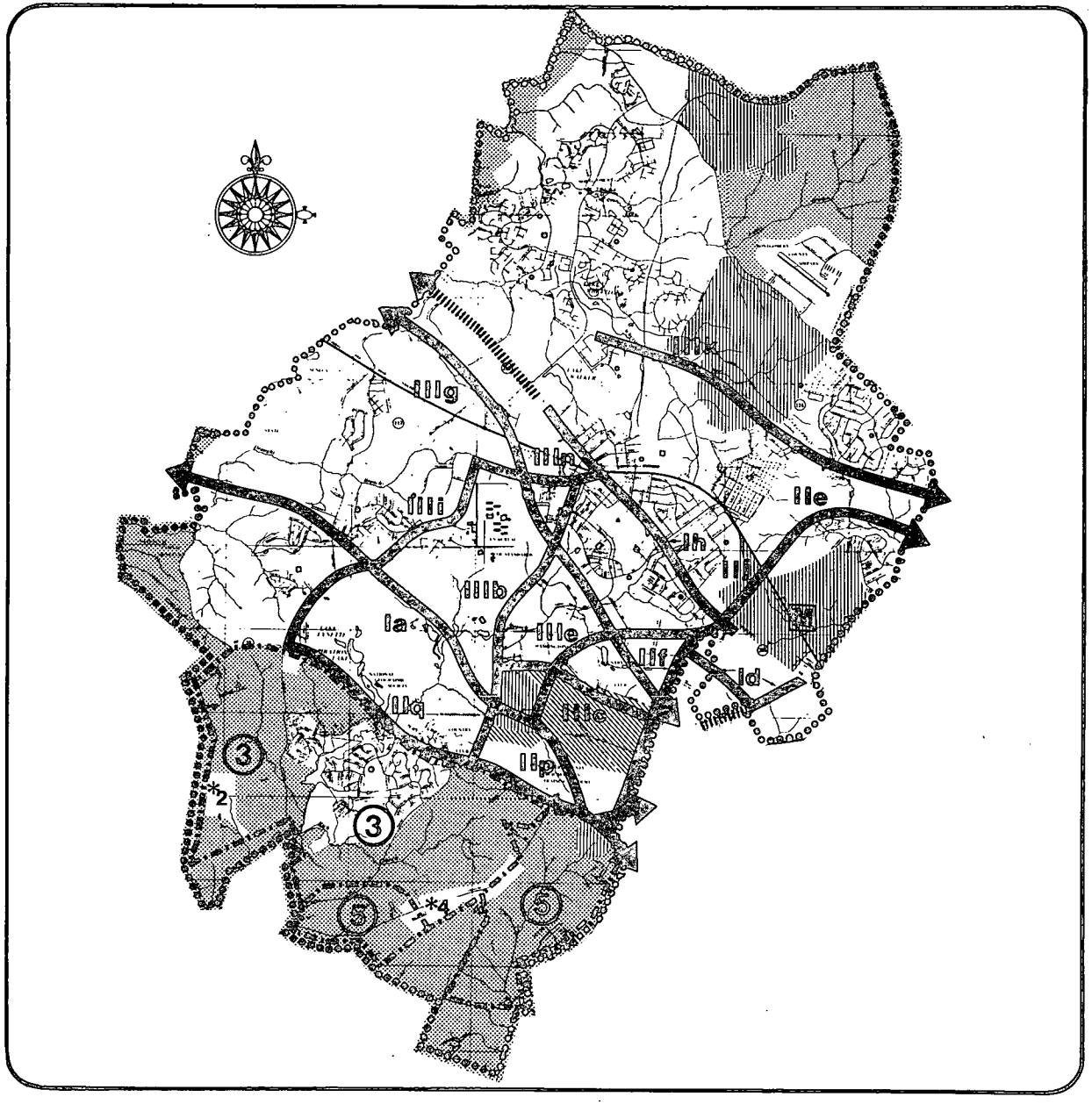
SEWER SERVICE CATEGORY

- S-1 & S-2
- S-3
- S-4
- S-5
- S-6
- *5 COMMUNITY SERVICE AREA
- (4) PROPOSED SERVICE CATEGORY

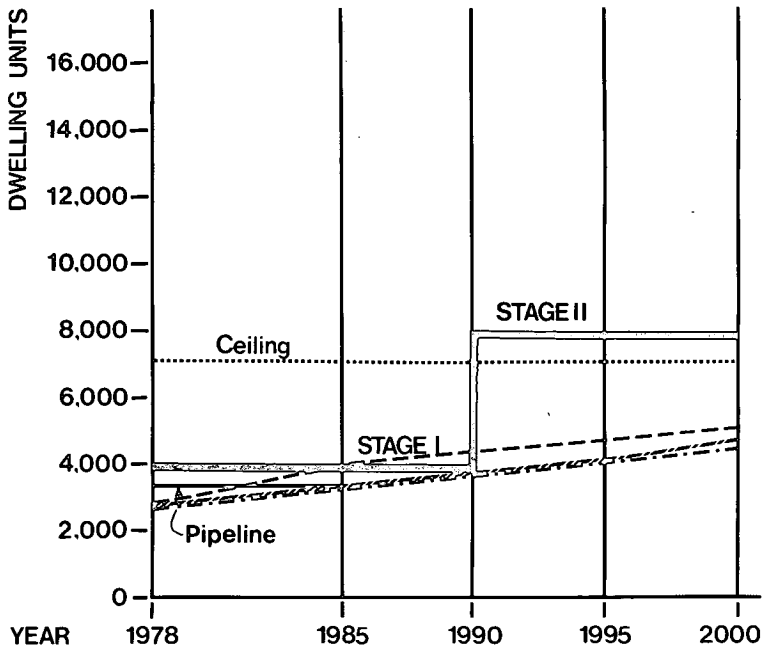
- POLICY AREAS & TRAFFIC SHEDS
- PROPOSED SERVICE AREA
- REQUIRED ROADWAY OF ADJOINING AREA
- REQUIRED ROADWAY WITHIN AREA
- M METRO

LOCATION MAP





COLESVILLE POLICY AREA



ADDITIONAL DWELLING UNITS (Cumulative)				
Ceiling	4,250		Pipeline	513
	1978 - 1985	1978-1990	1978-1995	1978-2000
High	1,000	1,350	1,900	2,350
Inter.	300	650	1,050	1,750
Low	250	600	950	1,550
THRESHOLDS				
Dwellings	1,000	1,000	5,000	5,000
Employment (Square feet)	50,000	50,000	50,000	50,000

CLOVERLY TRAFFIC SHED

Stage		Roadway	State or County	Estimated Cost	Limits
I*	(d)	Bonifant Rd.	(C)	$3,471,000	Layhill Rd to New Hamp. Av
	(f)	Good Hope Rd.	(C)	$250,000	New Hamp. Av to Blanton Rd
II	(a)	Md Route 650	(S)	$2,890,000[1/]	Randolph Rd to Briggs Chaney Rd

[1/] Source: Montgomery County Critical Highway Needs (1979-1998) for Secondary System by Md DOT.

*Included in current County Program for Construction

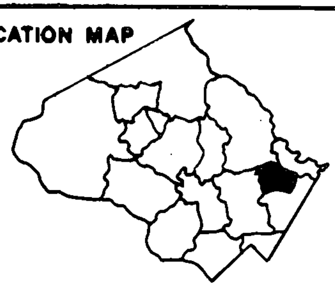
NOTES

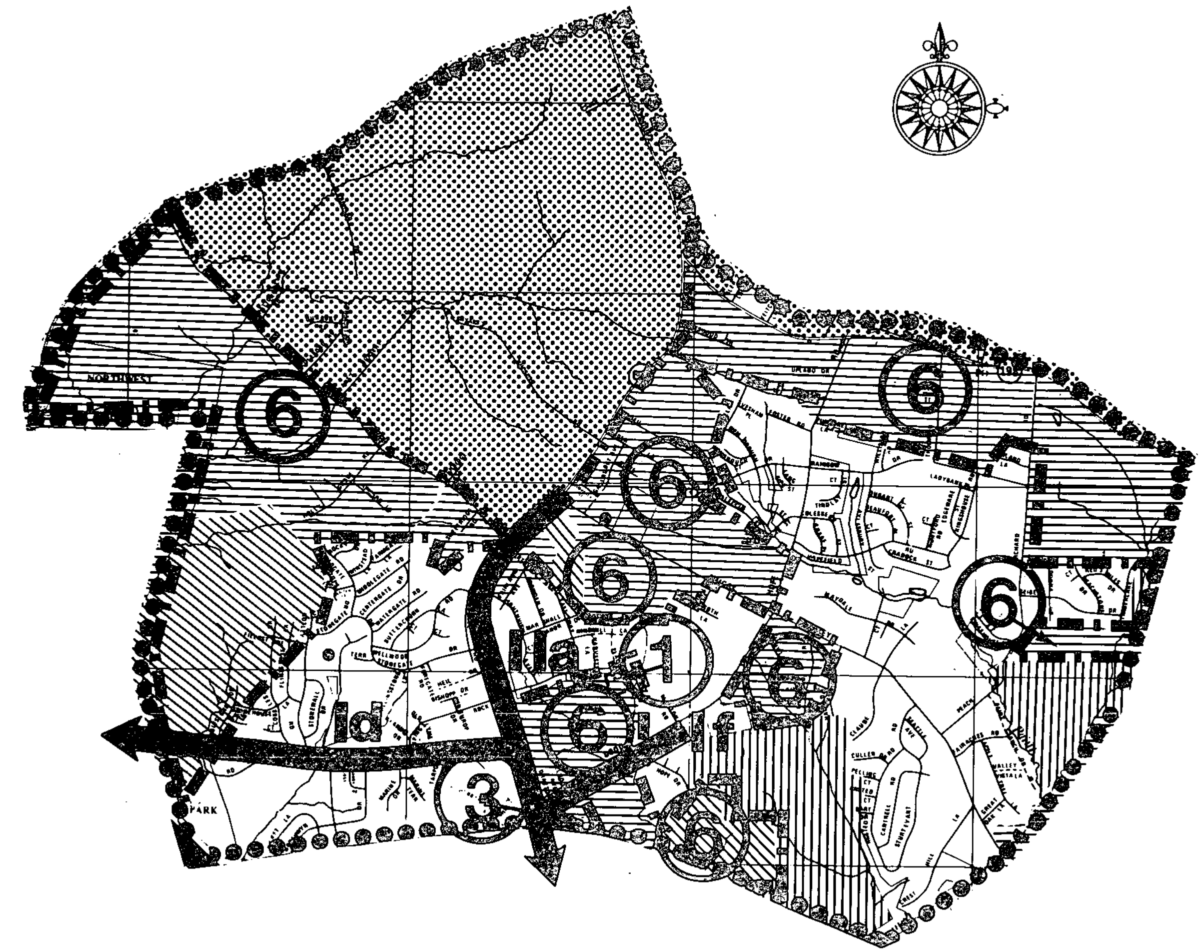
CLOVERLY TRAFFIC SHED

SEWER SERVICE CATEGORY

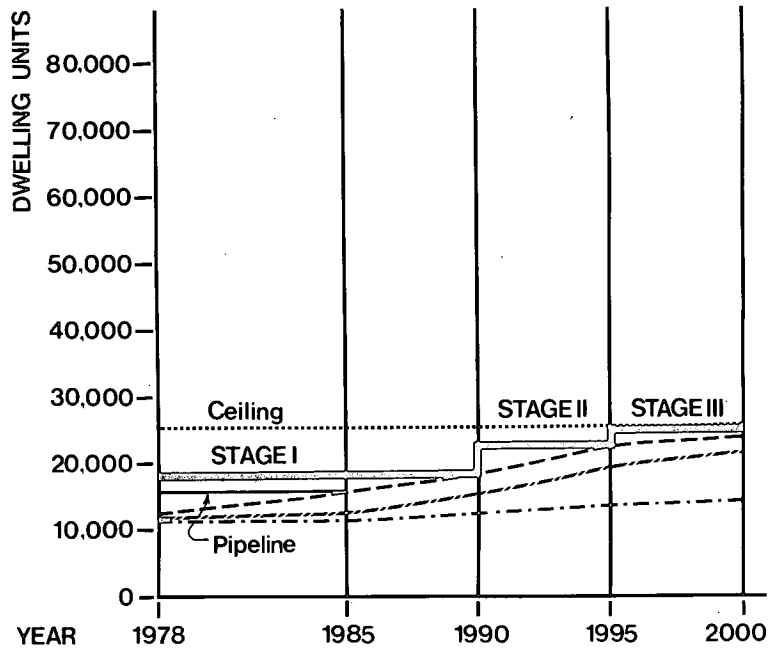
- S-1 & S-2
- S-3
- S-4
- S-5
- S-6
- *5 COMMUNITY SERVICE AREA
- (4) PROPOSED SERVICE CATEGORY
- ●●●●● POLICY AREAS & TRAFFIC SHEDS
- PROPOSED SERVICE AREA
- REQUIRED ROADWAY OF ADJOINING AREA
- REQUIRED ROADWAY WITHIN AREA
- [M] METRO

LOCATION MAP





COLESVILLE POLICY AREA



ADDITIONAL DWELLING UNITS (Cumulative)				
Ceiling	13,200		Pipeline	4,180
	1978 - 1985	1985-1990	1990-1995	1995-2000
High	3,500	5,950	8,400	9,900
Inter.	2,400	3,800	6,500	7,950
Low	1,700	2,250	3,400	4,200
THRESHOLDS				
Dwellings	6,000	6,000	10,000	13,200
Employment (Square feet)	600,000	600,000	1,500,000	1,500,000

FAIRLAND/WHITE OAK TRAFFIC SHEDS

Stage		Roadway	State or County	Estimated Cost	Limits
II	(a)	U.S. 29 Widening	(S)	$67,000,000	New Hamp. Av to Briggs Chaney Rd
	(b)	U.S. 29 Spur	(S)	$7,500,000	New Hamp. Av to Univer. Blvd
	(c)	Intercounty Connector	(S)	$3,000,000[1]	Rockville Facility to Interstate 95
	(e)	Randolph Road	(C)	$1,600,000	New Hamp. Av to PG Co
	(g)	Fairland Road	(C)	$3,800,000	Randolph Rd to US 29
III		Transit Improvements			

[1]Includes cost for section in Kensignton-Wheaton Policy Area

NOTES

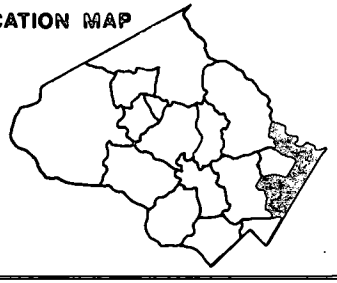
FAIRLAND & WHITE OAK TRAFFIC SHEDS

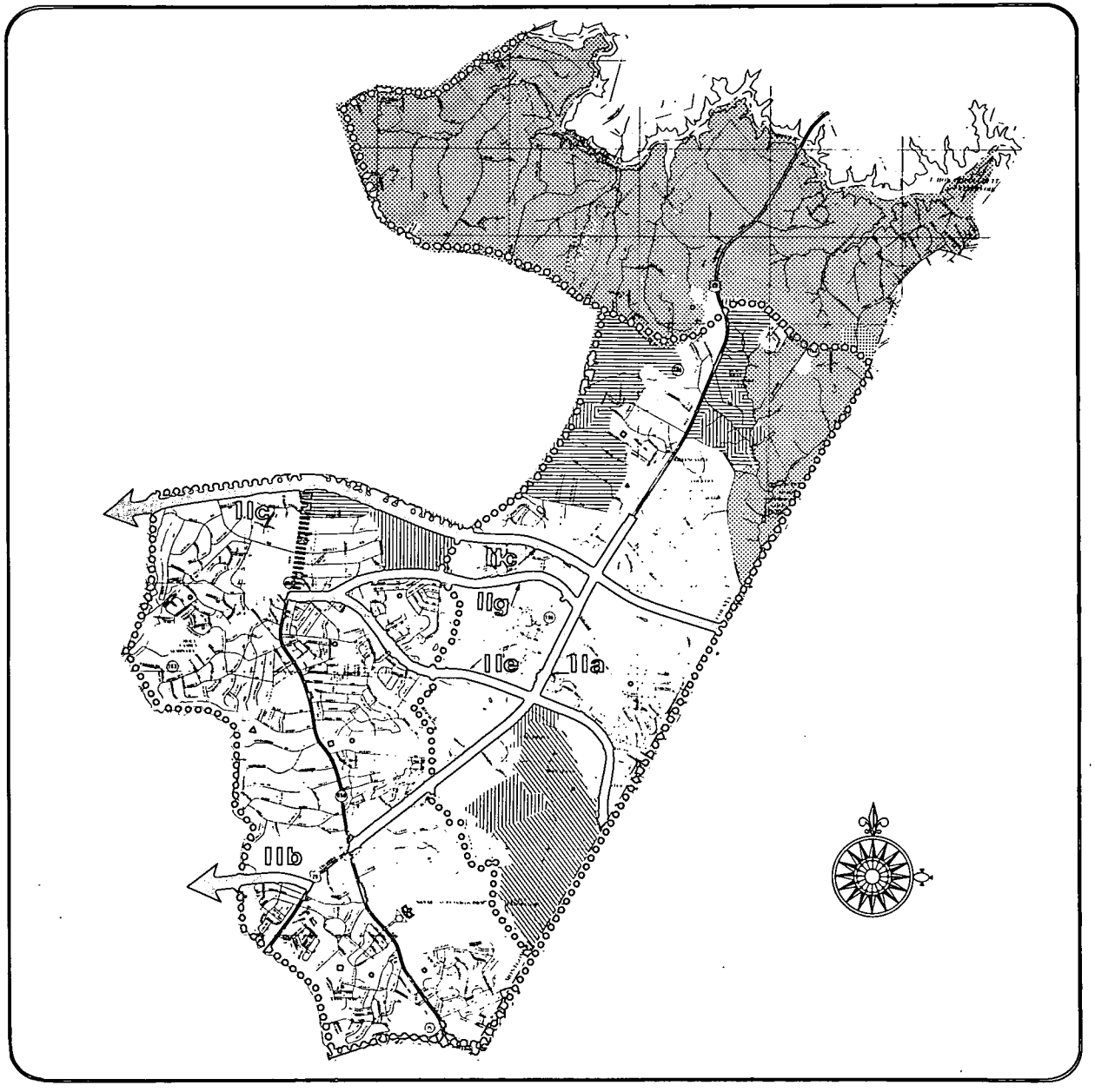
SEWER SERVICE CATEGORY

- S-1 & S-2
- S-3
- S-4
- S-5
- S-6
- *5 COMMUNITY SERVICE AREA
- (4) PROPOSED SERVICE CATEGORY

- POLICY AREAS & TRAFFIC SHEDS
- PROPOSED SERVICE AREA
- REQUIRED ROADWAY OF ADJOINING AREA
- REQUIRED ROADWAY WITHIN AREA
- (M) METRO

LOCATION MAP





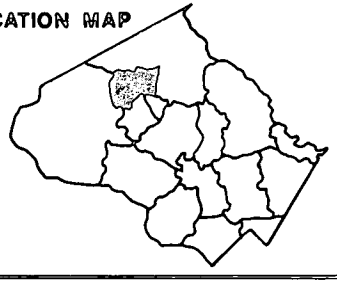
I-270 POLICY AREA CLARKSBURG TRAFFIC SHED

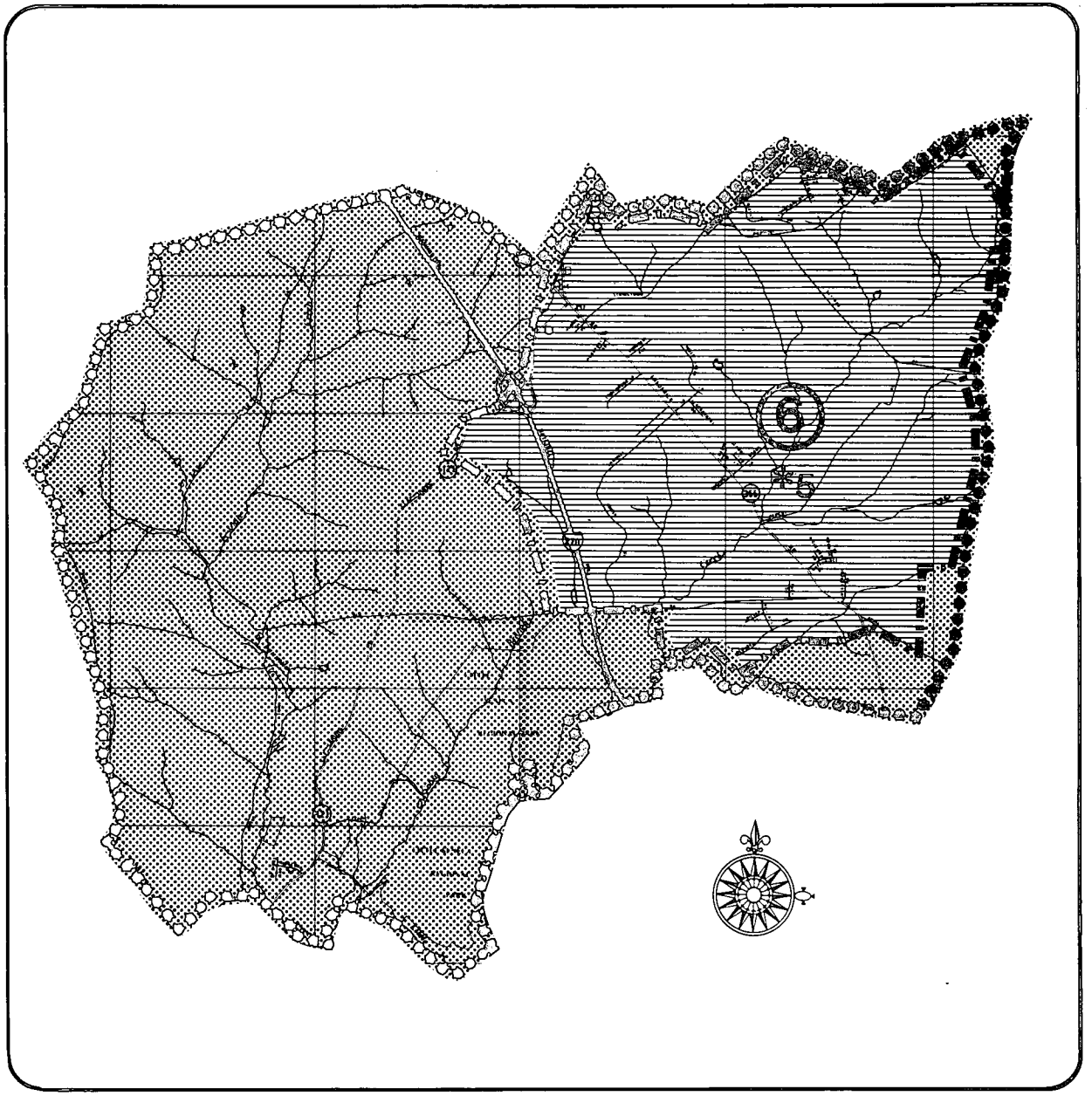
SEWER SERVICE CATEGORY

- S-1 & S-2
- S-3
- S-4
- S-5
- S-6
- *5 COMMUNITY SERVICE AREA
- (4) PROPOSED SERVICE CATEGORY

- POLICY AREAS & TRAFFIC SHEDS
- PROPOSED SERVICE AREA
- REQUIRED ROADWAY OF ADJOINING AREA
- REQUIRED ROADWAY WITHIN AREA
- [M] METRO

LOCATION MAP





GROUP III - NORTH BETHESDA POLICY AREA

Transportation Thresholds

The combination of 1995 dwelling units, employment, and transportation facilities results in a projected 34 percent of VMT at LOS E, or worse. A staging threshold of 12,000 dwelling units, which slightly exceeds the high growth forecast of 11,400, is recommended for this Policy Area. The recommended staging threshold is still below the current zoning ceiling of 19,000 dwelling units.

GROUP III - KENSINGTON-WHEATON POLICY AREA

Transportation Thresholds

The results of the combined transportation level of service analysis of Kensington-Wheaton are very similar to North Bethesda. The projected 29 percent VMT at LOS E, or worse, is higher than the standard of 50 percent. The high growth forecast of 11,000 dwelling units tested in the model is close to the current zoning ceiling of 15,400 dwelling units. Therefore, the recommended Stage II staging threshold approximates the zoning ceiling after full transit service is available in the area.

Since Metrorail to Glenmont is not expected to be operational until after 1985, a Stage I limitation must be imposed on growth until the supporting transit feeder bus service can be implemented. The Stage I threshold is recommended to correspond to the pipeline commitment of approximately 7,400 additional dwelling units.

GROUP IV - BETHESDA POLICY AREA

Transportation Thresholds

The highway level of service projected for this policy area under the high forecast for 1995 is 58 percent of VMT at LOS E, or worse. This is slightly better than the acceptable standard of 65 percent. The 6,900 dwelling units tested in the transportation model is slightly less than the current zoning ceiling of 7,800 dwelling units. Since some excess transportation capacity exists, it is recommended that the staging threshold be set at the current zoning ceiling of 7,800 dwelling units.

However, growth between now and 1985 should be slightly restricted until Metrorail stations at Friendship Heights, Bethesda and the Medical Center are operational and fully served by a bus transit feeder/circulation system. This would result in a Stage I threshold of 6,000 additional dwelling units until 1985, when the Stage II threshold of 7,800 would govern.

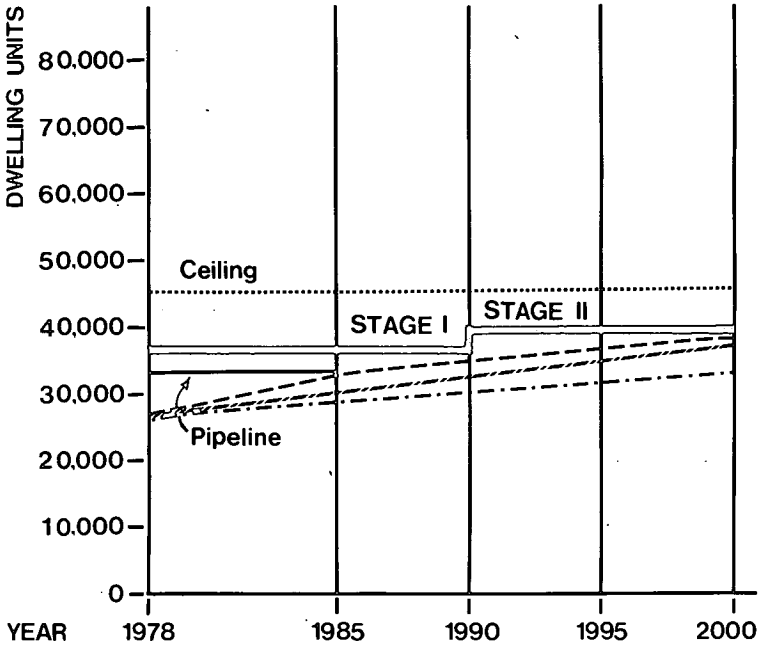
GROUP IV - SILVER SPRING POLICY AREA

Transportation Thresholds

The amount of residential development tested in 1995 equaled the current zoning ceiling of 8,400 additional dwelling units. The resulting measure of highway level of service at 64 percent of VMT at LOS E, or worse, corresponds to the acceptable standard of 65 percent. Therefore, it is recommended that the Stage I threshold be set equal to the zoning ceiling.

All transportation projects needed by 1995 are either in-place or programmed for construction. This includes Metrorail to Silver Spring and County operated Ride-On Transit.

NORTH BETHESDA POLICY AREA



ADDITIONAL DWELLING UNITS (Cumulative)				
Ceiling	19,000		Pipeline	5,735
	1978 - 1985	1978-1990	1978-1995	1978-2000
High	6,100	8,600	11,400	12,850
Inter.	3,500	5,900	7,050	8,700
Low	2,400	4,150	5,150	5,950
THRESHOLDS				
Dwellings	9,000	9,000	12,000	12,000
Employment (Square feet)	2,500,000	6,300,000	6,300,000	6,300,000

Stage		Roadway	State or County	Estimated Cost	Limits
I*	(b)	Gude Drive	(C)	$750,000	I-270 to Inter. Co. Conn.
	(d)	Twinbrook Pkwy.	(C)	$2,250,000	Md 355 to Viers Mill Rd
	(h)	Transit Station access incl. Nebel St., Nicholson Lane, Executive Blvd. Ext., and Marinelli Rd.	(C)	$1,770,000	N/A
II	(a)	Rockville Fac.	(S)	$95,000,000	I-270 to Inter. Co. Conn.
	(c)	Aspen Hill Rd. Ext.	(C)	$1,750,000	Viers Mill Rd to Twinbrook Pkwy
	(e)	Tuckerman Lane	(C)	$1,700,000	Seven Locks Rd to Md 355
	(f)	Ritchie Pkwy	City	$3,850,000	Md 28 to Md 355
	(g)	I-270 Including Interchanges	(S)	$81,000,000[1]	I-270 Spur to Md 118

[1]Total Project Cost
*Included in current State or County Program for Construction

NOTES

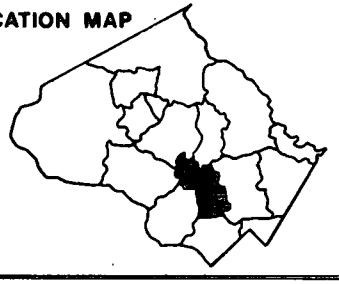
NORTH BETHESDA POLICY AREA

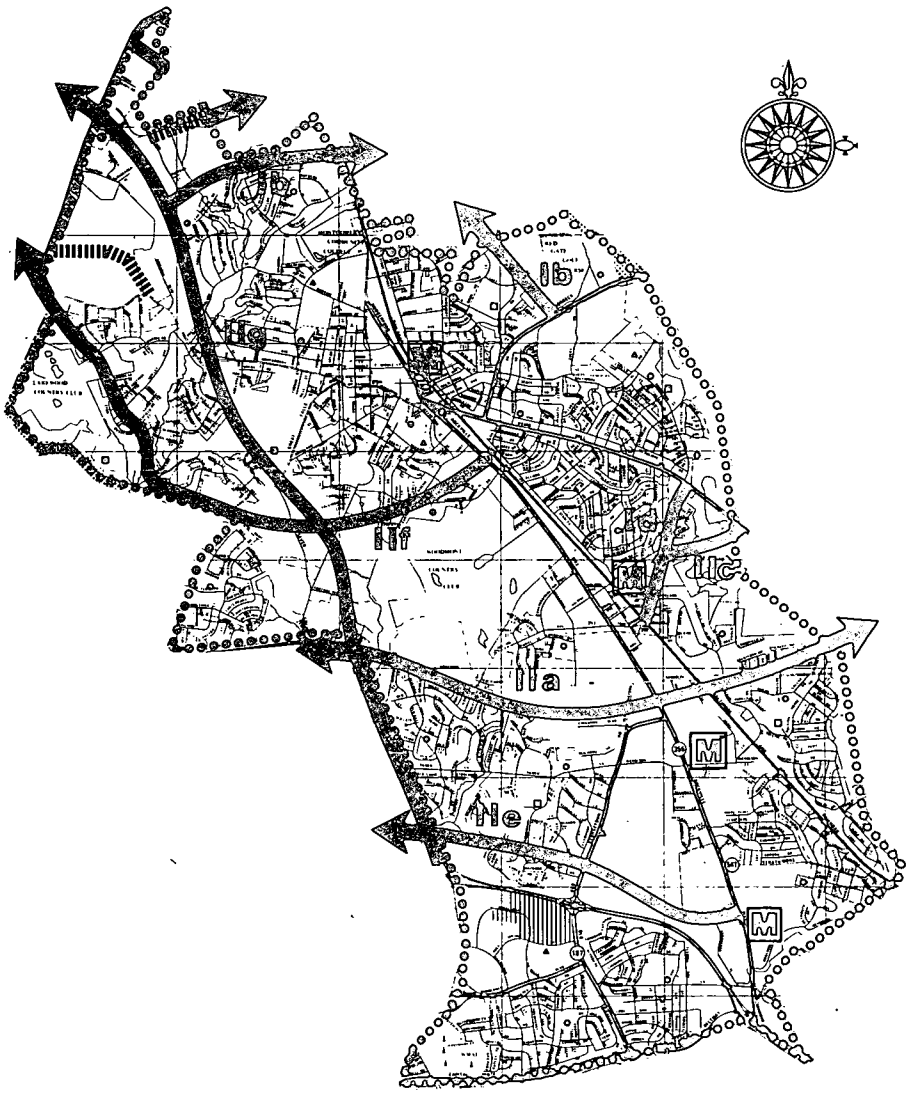
SEWER SERVICE CATEGORY

- S-1 & S-2
- S-3
- S-4
- S-5
- S-6
- *5 COMMUNITY SERVICE AREA
- (4) PROPOSED SERVICE CATEGORY

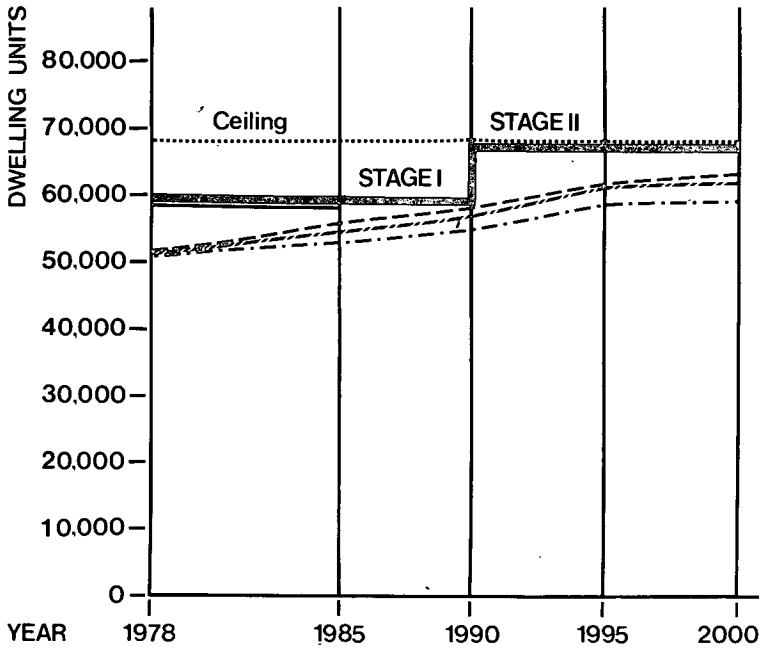
- POLICY AREAS & TRAFFIC SHEDS
- PROPOSED SERVICE AREA
- REQUIRED ROADWAY OF ADJOINING AREA
- REQUIRED ROADWAY WITHIN AREA
- M METRO

LOCATION MAP





KENSINGTON / WHEATON POLICY AREA



ADDITIONAL DWELLING UNITS (Cumulative)				
Ceiling	15,400		Pipeline	7,363
	1978 - 1985	1978-1990	1978-1995	1978-2000
High	5,700	8,500	11,000	12,900
Inter.	4,250	6,350	9,900	11,500
Low	3,200	4,670	5,570	6,620
THRESHOLDS				
Dwellings	7,400	7,400	15,000	15,000
Employment (Square feet)	300,000	1,800,000	1,800,000	1,800,000

Stage		Roadway	State or County	Estimated Cost	Limits
I*	(c)	Georgia Avenue	(S)	$10,072,000	Bel Pre Rd to Norbeck Rd
	(d)	Norbeck Road	(S)	$4,190,000	Bauer Dr to Georgia Av
	(f)	Bel Pre Road	(C)	$1,760,000	Georgia Av to Layhill Rd
II	(a)	Rockville Facility	(S)	$95,000,000[1][2]	I-270 to Inter. Co. Conn.
	(b)	U.S. 29 Spur	(S)	$3,000,000[2]	Univer. Blvd to New Hamp. Av
	(e)	Intercounty Connector	(S)	$80,000,000[1]	
	(g)	Transit access projects at Forest Glen, Wheaton & Glenmont Transit Stations	(C&S)	$539,000	N/A

[1]Total project cost

[2]Includes cost for section in Colesville Policy Area
*Included in current State or County Program for Construction

NOTES

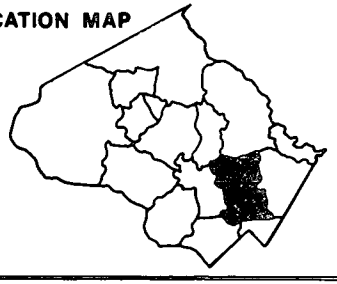
KENSINGTON & WHEATON POLICY AREA

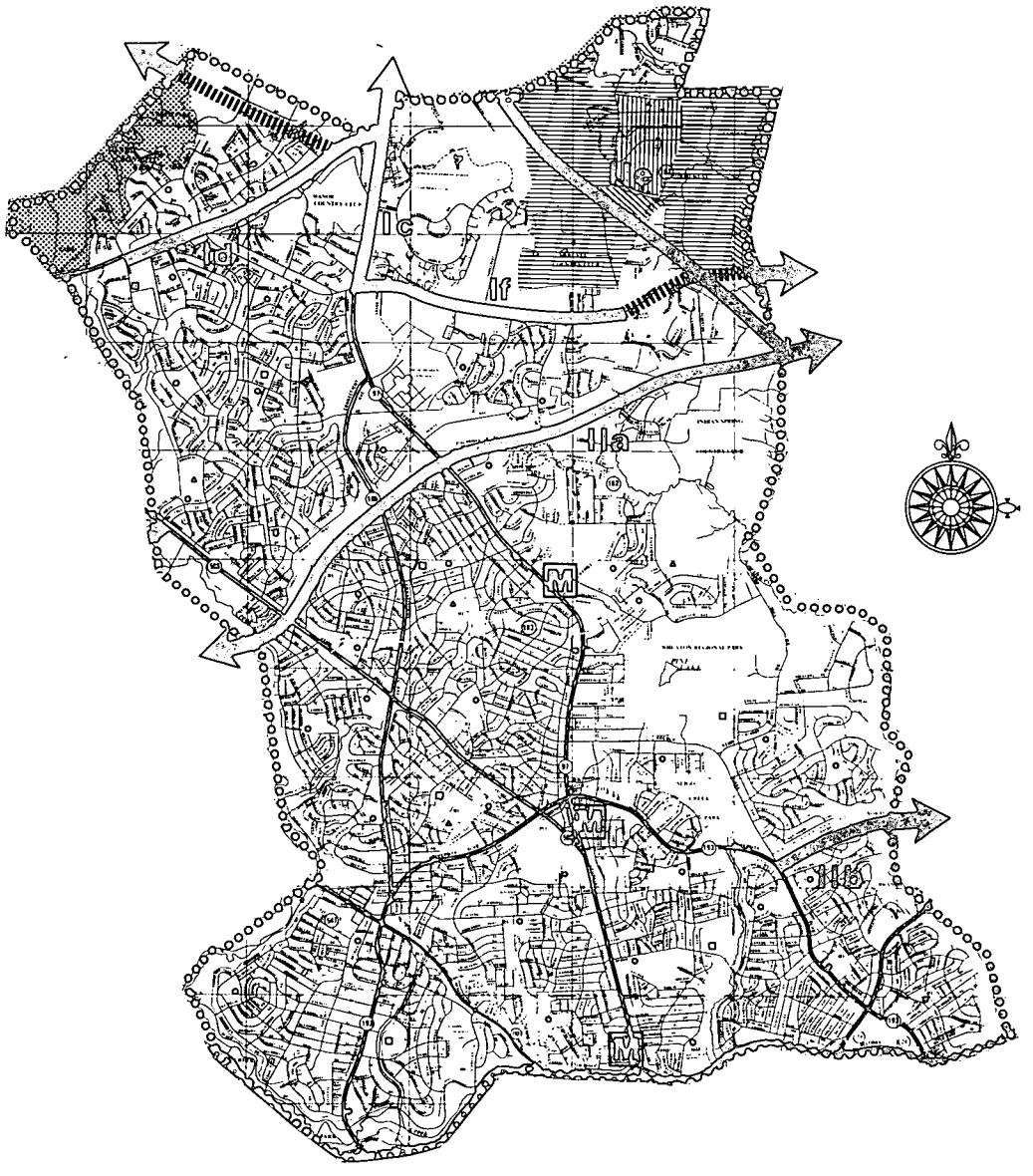
SEWER SERVICE CATEGORY

- S-1 & S-2
- S-3
- S-4
- S-5
- S-6
- *5 COMMUNITY SERVICE AREA
- (4) PROPOSED SERVICE CATEGORY

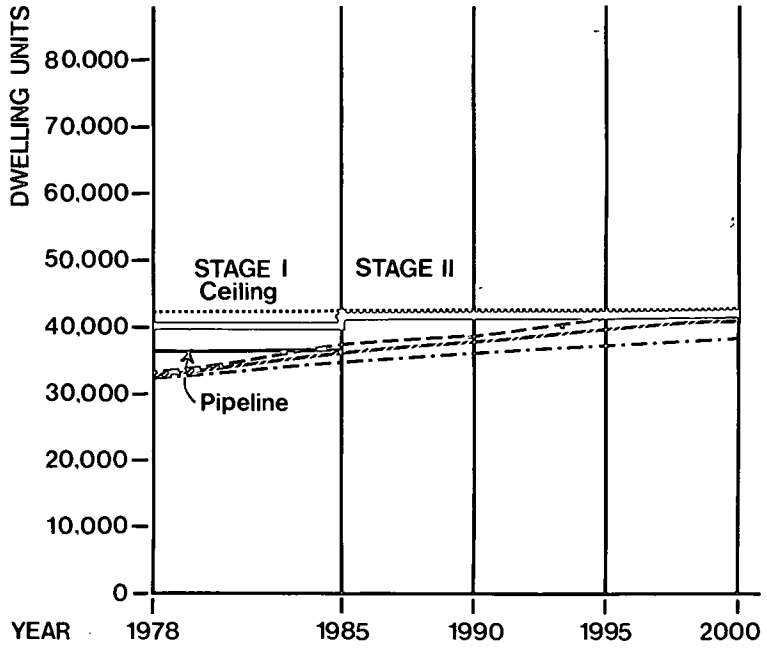
- POLICY AREAS & TRAFFIC SHEDS
- PROPOSED SERVICE AREA
- REQUIRED ROADWAY OF ADJOINING AREA
- REQUIRED ROADWAY WITHIN AREA
- M METRO

LOCATION MAP





BETHESDA POLICY AREA



ADDITIONAL DWELLING UNITS (Cumulative)				
Ceiling	7,800		Pipeline	2,487
	1978 - 1985	1978-1990	1978-1995	1978-2000
High	3,300	4,800	6,900	7,650
Inter.	2,900	4,350	6,900	7,650
Low	1,750	2,750	3,600	4,400
THRESHOLDS				
Dwellings	6,000	7,800	7,800	7,800
Employment (Square feet)	3,300,000	6,500,000	6,500,000	6,500,000

Stage		Roadway	State or County	Estimated Cost	Limits
I	(a)	I-495	(S)	$43,135,000	Md Rt 355 to Georgia Av
	(b)	I-495 Including Cabin John Bridge	(S)	$27,000,000	Cabin John Br to River Rd
II		Full service by bus transit feeder/ circulation system			

[1]Included in current State Program for Construction

NOTES

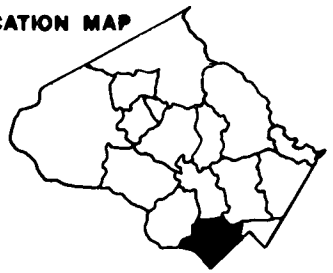
BETHESDA POLICY AREA

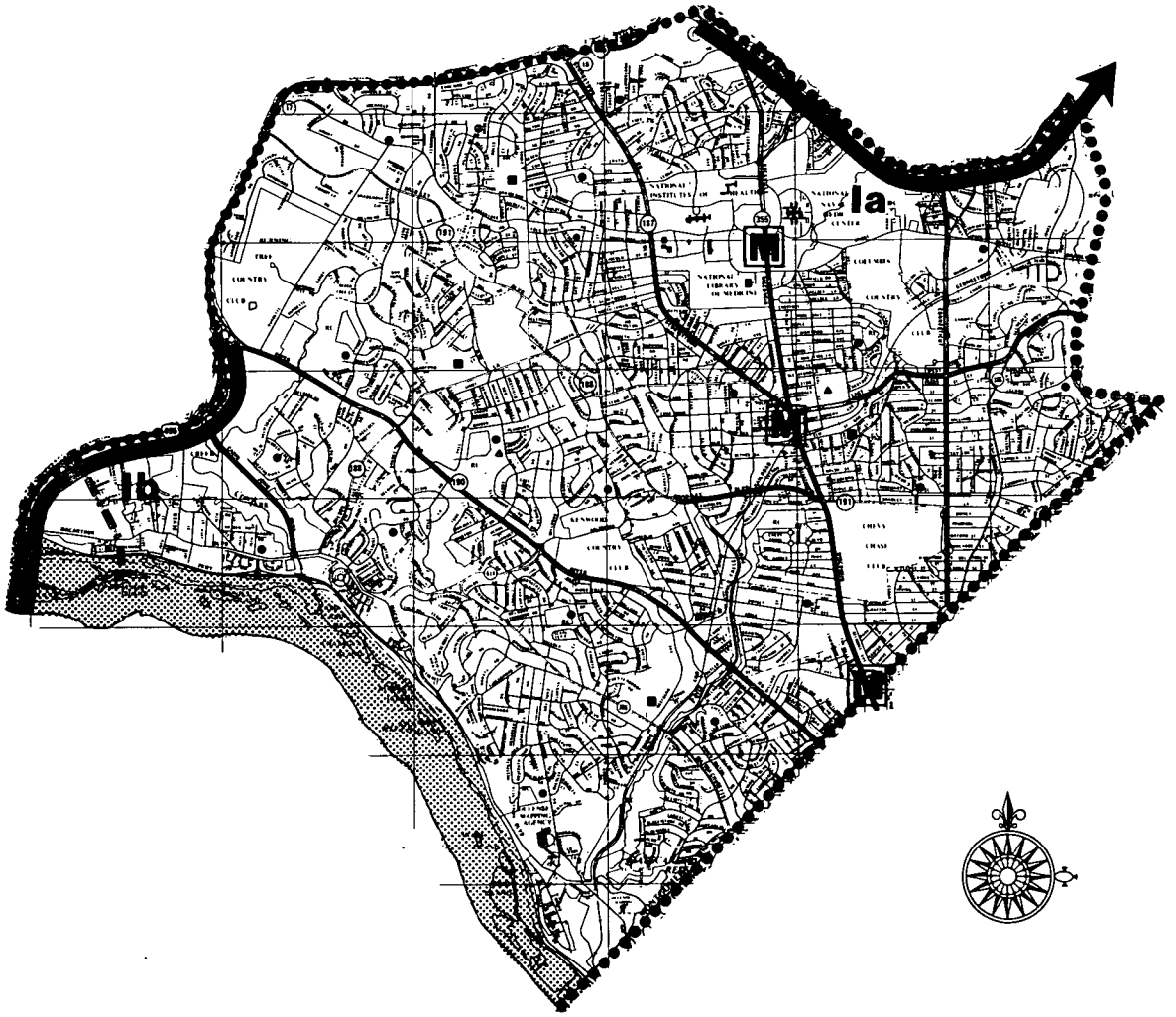
SEWER SERVICE CATEGORY

- S-1 & S-2
- S-3
- S-4
- S-5
- S-6
- *5 COMMUNITY SERVICE AREA
- (4) PROPOSED SERVICE CATEGORY

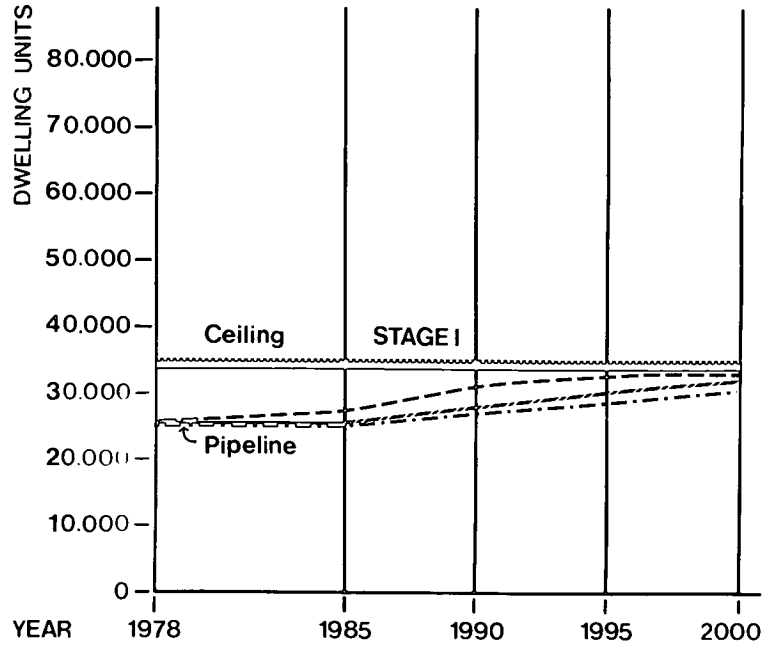
- POLICY AREAS & TRAFFIC SHEDS
- PROPOSED SERVICE AREA
- REQUIRED ROADWAY OF ADJOINING AREA
- REQUIRED ROADWAY WITHIN AREA
- M METRO

LOCATION MAP





SILVER SPRING/TAKOMA PARK POLICY AREA



ADDITIONAL DWELLING UNITS (Cumulative)				
Ceiling	8400		Pipeline	374
	1978 - 1985	1978-1990	1978-1995	1978-2000
High	700	4,350	6,400	8,000
Inter.	250	3,050	4,700	6,250
Low	150	1,160	2,540	3,700
THRESHOLDS				
Dwellings	8,400	8,400	8,400	8,400
Employment (Square feet)	3,300,000	3,300,000	3,300,000	3,300,000

Stage	Roadway	State or County	Estimated Cost	Limits
I	(a) I-495*	(S)	$43,135,000[1]	I-270 to Georgia Av

1 Total Project Cost

*Programmed in current State Program for construction.

NOTES

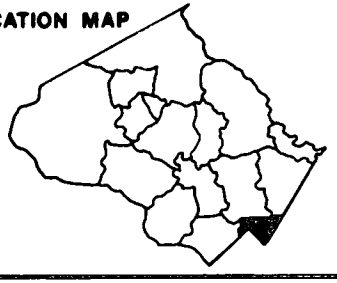
SILVER SPRING & TAKOMA PARK TRAFFIC SHEDS

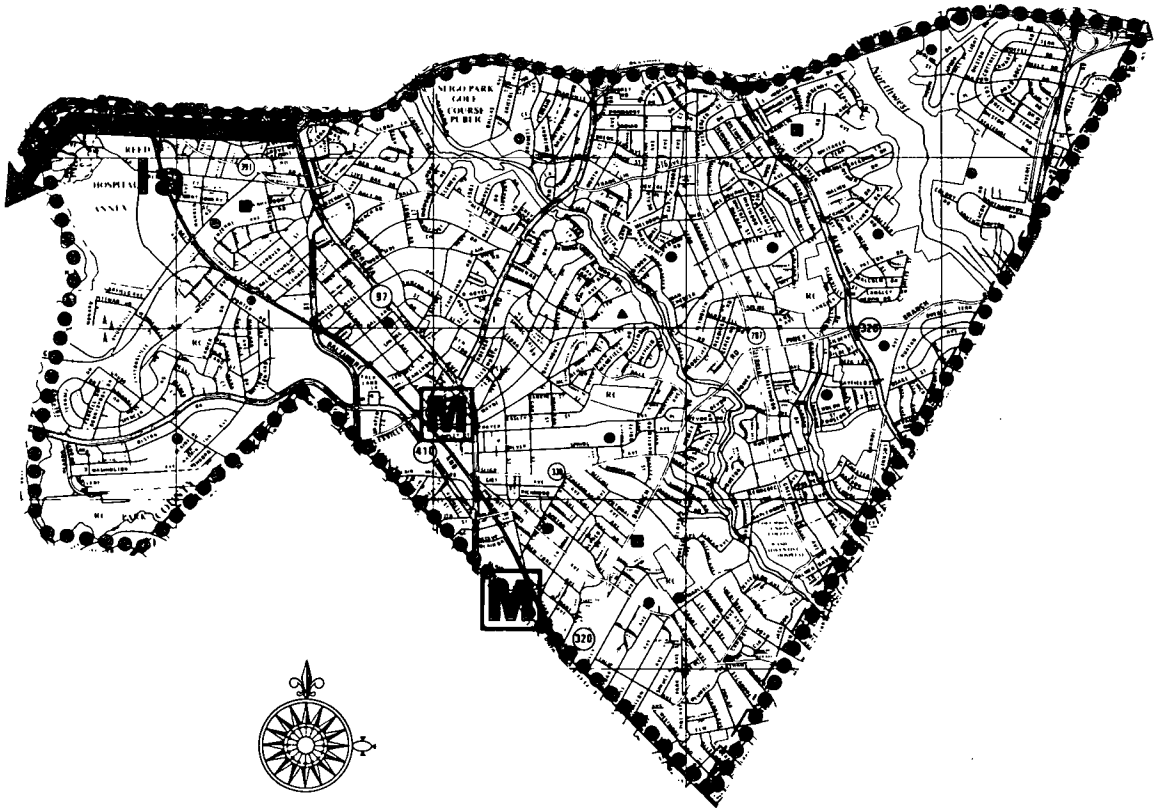
SEWER SERVICE CATEGORY

- S-1 & S-2
- S-3
- S-4
- S-5
- S-6
- *5 COMMUNITY SERVICE AREA
- (4) PROPOSED SERVICE CATEGORY

- POLICY AREAS & TRAFFIC SHEDS
- PROPOSED SERVICE AREA
- REQUIRED ROADWAY OF ADJOINING AREA
- REQUIRED ROADWAY WITHIN AREA
- M METRO

LOCATION MAP





NOTES

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